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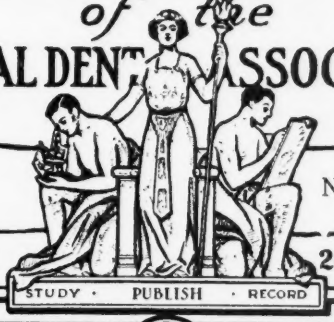

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Care of Face and Jaw Injuries.—*Ivy.*

System in Teaching Prosthetic Dentistry.—*Mauk.*

Report of Laboratory Investigations on Root Filling Materials.—*Price.*

School for Dental Officers, U. S. Navy. —*Editorial.*

Demobilization of the S. A. T. C.—*Editorial.*

All Restrictions on Gold and Platinum Revoked. —*Editorial.*

1918 Goal for Relief Fund
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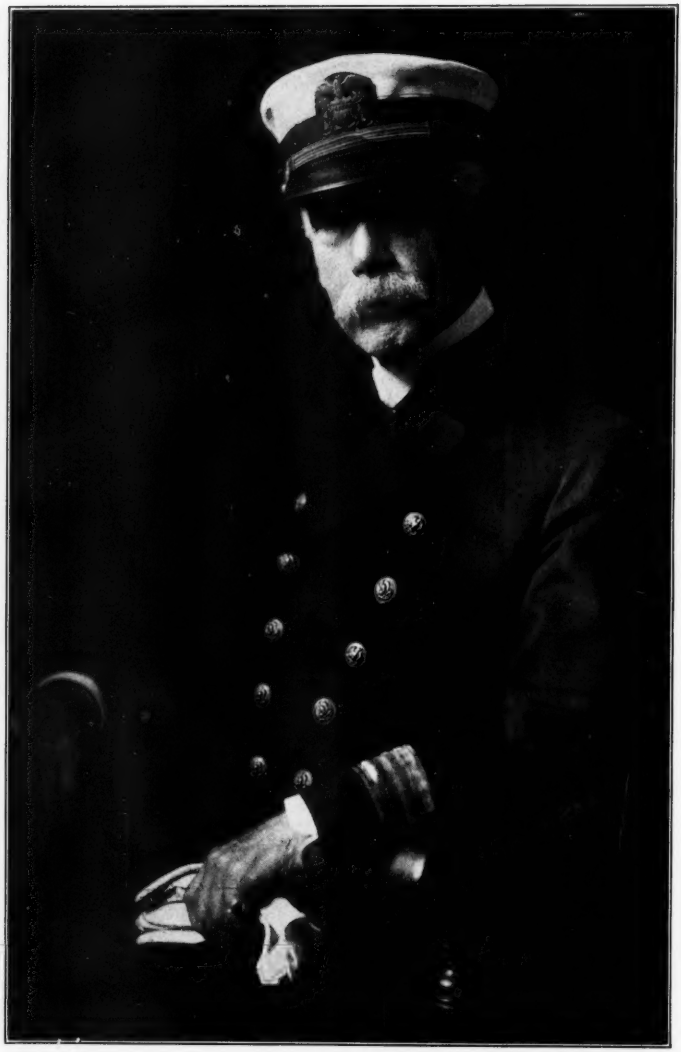

LIEUTENANT COMMANDER RICHARD GRADY, U. S. N.

The first officer commissioned in the grade of dental surgeon in the U. S. Navy. Appointed in 1899 for duty at the Naval Academy, he has been longer in the Government service than any member of the Dental Corps, Army or Navy.

THE JOURNAL
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VOL. 5 DECEMBER, 1918 NO. 12

Original Communications.

A SCIENTIFIC TECHNIC IN THE CONSTRUCTION OF ARTIFICIAL DENTURES IN WHICH THE LATEST AND MOST APPROVED METHODS HAVE BEEN ORGANIZED IN A METHODICAL SEQUENCE.

By M. M. House, D. D. S., Indianapolis, Ind.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

WITH the universal acceptance by the medical profession as a whole, of the dependence of health upon the teeth and the recognition of the effect of the blind abscess which lies at the root of much disease, as well as at the roots of the teeth, the importance of the artificial denture has grown and must continue to grow in the future; for full or partial extraction more and more will be indicated for prevention and cure of infectious conditions.

It is then essential that the artificial denture shall receive more attention and scientific treatment, that it may as nearly as possible approximate the natural denture.

No dentist will deny the fact that the most successful dentures constructed at present fall far short of the natural in masticating efficiency, which, in the last analysis, is the most necessary function of teeth whether they be natural or artificial.

The satisfaction of the patient should by no means be the only concern of the profession, for the average persons wearing artificial dentures are satisfied with far less than the best, because they

are educated by the profession not to expect much as regards comfort, appearance or service. We ourselves in the profession are "influenced by fashion, convention and tradition," but when some epoch-making dentist succeeds in changing the fashion, we all wonder how we were ever satisfied with these conventionalized imitations. To realize that this is a fact, we need only to think of some of the epoch-making changes that have come about in our own day thru the efforts of such men as Bonwill, Snow, Walker, Green Bros., Haskel, Wilson, Gysi, Williams, Giffin, Hall and many others who have contributed to the evolution, and who prove to us that the artificial denture has not reached its present important position in prosthesis by any decided leap but by a progressive development of unconscious processes, which are generally elemental and momentous.

Whether the methods taught in the schools today are scientific enough to meet the needs of the average practitioner, is doubtless an open question but that the average practitioner is dissatisfied with the technic in vogue is no longer a question, but a fact. I have come to this conclusion in confidential talks with hundreds of dentists in numerous conventions, societies and study clubs, tho to be sure, these men are not the rank and file of the profession but the better, more ambitious men, as is evidenced by the very fact that they attend these meetings, to voice their dissatisfaction with present methods and their desire to improve them.

Our service demands more than the expression of esthetic feeling, its greater value is utilitarian. Artists of every period have accepted the aphorism that "the height of art is to conceal art" and this aim we should adopt in our work, for design and construction in artificial denture like design and construction in architecture, may be classed both as fine art and industrial art, in proportion as the dentist succeeds in disguising artificiality and attaining maximum efficiency.

I believe that the average dentist is both willing and axious to be successful in the best sense of that word, that he is anxious to be fair not only to himself but to the patient,—the trouble is he does not know how to accomplish this. I believe also, that the real reason why so many men fail to improve themselves and their work is because they give too much time and effort to production based on a pecuniary consideration and consequently they depend upon unvaried routine in all cases, failing to take advantage of new methods and discoveries which the leaders of the profession are constantly bringing to light.

If all of us were geniuses or took up our work for the love of it, there would be no necessity for definite technic, but in all walks of life the leaders are few and the followers many, hence, when so much depends upon results a clear setting forth of procedure in minute detail is absolutely essential to success.

It has been my ambition to systematize a technic in which every step shall be definite and teachable and logical. No clearer concept of the following of this process has been presented than that emanating from the pen of Dr. Orton, who says: "Technic may be likened to the road we might choose to reach a certain place; if we have a clear idea of where we are going, we shall be in a more enlightened position to choose the road. In going thru a new country, however, it is safer to stick to the road with many sign posts; after we learn the country we may safely try the short cuts."

The great mass of travelers must use the road, to the few is it vouchsafed to venture the short cuts and never until the main traveled road, is so well known as to present no questions but almost as second nature to be followed step by step.

So with our methods of procedure, the steps must be clearly set forth so that the average men may understand each process in turn, and the language used must be forcible enough to make the description a word picture in which all the details are brought out in so strong a light as to be stamped upon the learner's mind. Let this technic be so simply presented that it may be thoroly teachable, that it may be absolutely mastered in all its details and followed in the minutest particular; only by so following technic, until habit becomes second nature, may a practitioner become an expert, able to go forward alone and then perhaps, develop individual talent or even genius.

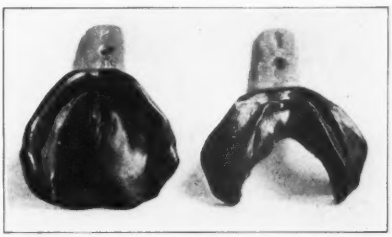
The mastering of a technic simply means then, habituating one's self to do a certain thing in a certain way; it means a clear and definite plan of what to do and how to do it and makes for the easier and surer formation of the habit. Such habits are the only ones to be depended upon in the emergency of our daily practice.

With this thought in view I present the following technic based upon the necessity for the greatest efficiency in artificial dentures. This necessity is illustrated by the "experiments of Dr. G. V. Black, begun in 1893, for the purpose of showing the pressure that it was possible to exert on the human teeth, and which brought out the fact in a tabulation of results that in one thousand persons, the average force exerted was 171 pounds on the molar teeth but much less on bicuspids and incisors. The variation was from 25 to 275 pounds," whereas the greatest force it was possible to exert on the same machine where artificial dentures were worn was from zero to 50 pounds. "Force required in the mastication of meats showed that the most tender meats required 3 to 5 pounds pressure, while tougher meats required from 15 to 90 pounds."

While these experiments were made by Dr. Black for the purpose of determining the resistance form required in cavity preparation, they have an equal application in determining the masticating limitations we may expect in artificial dentures, and suggest the need of a deeper cusp arrangement. This in my opinion, unquestionably allows of a greater masticating efficiency, which after all, I repeat, is the most essential function of the teeth, whether natural or artificial.

To begin with, it is absolutely necessary to make a careful mouth examination, noting with care the tissue conditions, muscle attachments and move-

Figure 1.



Shows the first (1st) step, the Hall method of taking impressions. Showing the taking of an impression with S. S. White's tray compound, for the making of an ideal tray.

ments, as well as the amount of absorption and the loss of facial contour. This examination is indicated as essential because the peripheral border of the impression is the first step in the restoration of said lost facial contour, the restoration of which is the patient's chief idea of a successful result and the attainment of which is usually his chief concern, tho but one of the features to be considered by a really conscientious dentist.

Hall Method of Impression Taking.

The first step in the impression is the fitting of a metal tray which closely approximates the area to be covered, care being taken that the borders at no point are high enough to raise the soft tissues or muscle attachments. An im-

pression is now taken with S. S. White Tray Compound in the same way that any ordinary modelling compound impression would be taken.

This tray compound is then removed from the metal tray, and trimmed to approximate proper facial restoration, care being taken to lower the margins so there will be no impingement on the muscle attachments and no displacement of tissue around the peripheral border.

Referring in particular to the lower impression it is necessary to have the buccal margins of the compound tray trimmed, so there is no impingement of

Figure 2.

Shows the compound tray trimmed to the proper size and form.

the muscles in the masseter region, nor overlapping of the cheek tissues.

In the lingual region it is necessary to make a very careful examination with the finger, the patient's tongue being raised to the roof of the mouth, thus plainly allowing the points of attachment of tissue to the bone along the floor of the mouth, to be felt.

If in doubt as to one's ability to properly trim the lingual margin of the lower tray, so there will be no impingement of tissue and yet retain all the lingual flange applicable to the case in hand, a simple way to get a perfect margin in this region is to trim the S. S. White Compound Tray slightly shorter than the required length and trace on this margin with Kerr's modelling compound, a small area at a time, then slightly heat over a fine point flame, dip in warm but not hot water, place the tray in the mouth and hold it down with the fore fingers, having the patient raise the tongue to the roof of mouth, moving it freely in all directions. When the entire lingual border has been traced in this manner and thoroly chilled, first trim away all undercuts, especially in the region of the mylo-hyoid ridge, then trim the edge with a knife to the thickness desired for the finished denture.

In the buccal and labial region, the compound tray should be trimmed to about the thickness of a brattania metal tray. This affords a free and unrestrained outlet for the flow of plaster, allowing no bulky masses to accumulate so that in the proper massaging of the cheeks and lip, it is possible to obtain the desired contour of these regions. In all cases after trimming, the tray should be placed in the mouth and a test made for impingement of muscle attachments and soft tissues.

For successful results, certain qualities are essential in the plaster to be used in these impressions. Owing to the small amount of plaster which it is possible to use, in these impressions, it must have peculiar qualities of hardness, smoothness, a uniform working property and a not too rapid setting. I have been able to find but one plaster which satisfactorily fills all these requirements and that is Kerr's Snow White Model Plaster.

The time required for the setting is governed by two things: the temperature of the water and some chemical agent, the amount of which must be determined by the operator. Salt is the agent commonly used but personally, I much prefer potassium sulphate as it does not, in any way, deteriorate the quality of the plaster when set.

To mix it: use tepid water with a small amount of potassium sulphate well dissolved, then sift the plaster, allowing it to become saturated as it settles in the solution. After a sufficient amount has been sifted, pour off the ex-

cessive water and stir thoroly. You will now have plaster of a thin creamy consistency, from which, by waiting for it to slightly set, you may get any consistency you desire for the special case in hand, as the tissue condition of each mouth requires a special treatment in order to obtain the desired result, tho the plaster must never be sufficiently stiff to be resistable in moulding the peripheral borders. I speak of moulding in this connection, because I employ a method of drawing the attachments involved to their low point of attachment and then massaging the face along the peripheral borders of the impression to mould them to proper form.

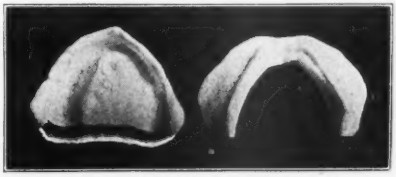
Note particularly at this point the fact that the upper and lower plaster impressions are taken in totally different manners.

Let us first consider the upper impression. The upper compound tray being properly trimmed for facial restoration and lowered for muscle and tissue attachments, the undercuts sufficiently trimmed to permit the plaster to flow freely past, we now place a sufficient amount of plaster mixed to proper creamy consistency in the tray, (the patient having been previously instructed to completely relax the facial muscles) place the tray in the mouth and move to place with gentle wavelike oscillating guidance, until seated by the test of gentle touch. When the plaster is of the proper consistency, mould the borders by holding the tray in place with the fore finger of each hand and with the thumbs, draw the lip in region of the phrenum and the facial muscles in the region of muscle attachments, freely downward. Then, with the thumbs, massage the facial tissues gently along the peripheral borders of the impression to properly muscle trim and perfect the facial contour as well as to properly place the soft marginal tissues. After the plaster is sufficiently set, remove and examine it to make sure that you have an ideal impression of the case. In case of failure. Either remove all the plaster from the compound tray and retake the impression or trim the plaster properly, (trimming out well in the muscle and phrenum regions) then soak it thoroly in water, placing in it a small amount of creamy plaster and replace in the mouth, using the same technic for placing tissues as before. This description covers the general technic used for this work with the exception of post-damming, tho, of course, it is impossible to consider here the many variations with which we have to deal in different cases.

POST-DAMMING: UPPER IMPRESSION.

In order to post-dam the upper impression, thoroly dry the plaster along the posterior border with cold compressed air, then, with a stick of Kerr's Modeling Compound, trace a small area across the posterior border up to the point of the hard palate, heat over a fine point flame, dip quickly in warm water, place in the mouth and, with firm and steady pressure, gently seat the impression in place. Remove and trim to the width and shape desired for the case in hand and if not satisfactory, re-heat and proceed as before until the desired result is obtained.

Figure 3.



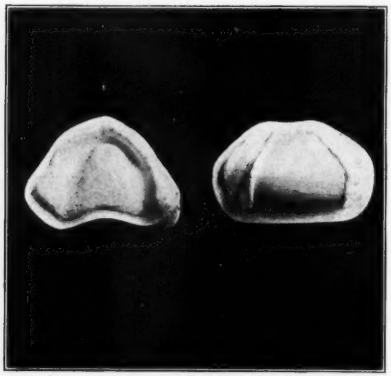
Shows plaster impressions taken in compound trays.

LOWER IMPRESSION:

Having your compound tray fitted, trimmed and tested, making sure it does not impinge on any of the movable tissues, and with undercuts sufficiently re-

moved to allow the plaster to flow freely by, proceed with the mixing of the plaster as for the upper impression. Having the patient with facial tissues entirely relaxed, place the compound tray with plaster of the proper consistency in the mouth and have the patient place his tongue in a high and forward position. Then gently move the tray to a seated position as before. Have the patient keep his tongue in the position noted

Figure 4.



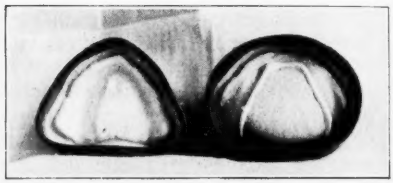
Shows first stage of boxing impressions.

above, hold the tray in place with the fore finger of each hand about the region of the first molar, then with the thumb and second finger of each hand, draw the facial tissues upward and inward over the outside borders, to properly muscle trim and perfect facial contour as well as to place the soft marginal tissues. When the plaster is sufficiently hard, remove and examine it carefully. In event of failure, before removing the plaster from the tray, correct any defects in the compound tray which may have caused impingement or displacement of tissue. Always remove all the plaster in the lower tray in case of failure, before taking another impression.

Trimming Inner Border of Lower Impression.

After the ideal impression is attained by this method, you will have a perfectly trimmed outer border with the excess plaster drawn up over the top of the tray, but the excess of plaster around the inner border will be spread in thick rolls between the tongue and the tray, leaving the margins much thicker than desired in the finished plate. It is, therefore, necessary to trim away this excess until it represents the thickness you desire to reproduce in the finished denture, remembering that this border would be represented by a groove in the

Figure 5.



Shows impressions boxed in ready for pouring of cast.

cast for reproduction of this margin of the finished plate.

Boxing in Impressions.

We now have our impressions properly taken, with muscle trimmed and tissue sealed borders. It is, therefore, necessary to prepare and box these impressions in the proper form in order to reproduce in our finished plate from the cast, all the minute detail of the muscle trimmed and tissue sealed borders obtained in the impression. (Illustrated with slides.)

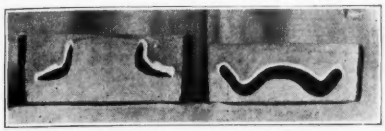
1. Impression shallaced and placed on a block of soft plaster to form a base.

2. Plaster trimmed to size of block desired for base and built up with plastaline leaving 1-16th of an inch of the entire peripheral margin of impression exposed, the plastaline forming a right

angle with the peripheral margin 1/8th of an inch wide.

3. Blocked in impression surrounded

Figure 6.



Shows cross section of boxed in impression and cast.

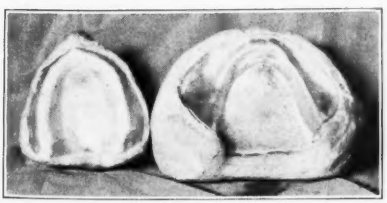
with wax to form a box and trimmed to the depth desired for the thickness of the finished cast.

Figure 7.

Shows casts taken from boxed in impressions, showing the preservation of borders for duplicating peripheral margins of impressions.

The advantages of boxing in impressions are three-fold, viz: to maintain and preserve the details of the peripheral

Figure 8.



Shows metal bite plates on casts.

border, to give proper size and thickness to the cast and to confine the material which adds pressure and gives greater density to the cast.

In order to obtain the best results, it is necessary to use hard material for making the casts, such as Weinstein's Artificial Stone or Spence's Plaster.

Making Bite Plates.

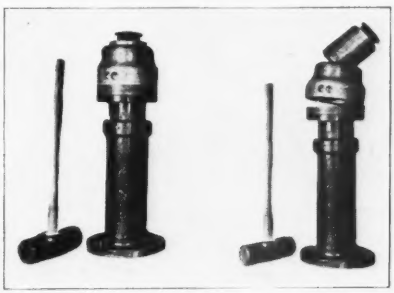
I myself use bite plates made of Ash's No. 7 Soft Tray Metal as used by Greene Bros. for swedging what they

Figure 9.

Shows metal bite plates removed from casts.

call Ideal Trays. I find a metal bite plate to be advantageous over shellac and gutta-percha preparations, because I am able to obtain a more perfect adaptation to the cast and they give a more positive result in obtaining uniform thickness of plates, not being affected by

Figure 10.



Shows putty swedger for swedging bite plates and all metal plates.

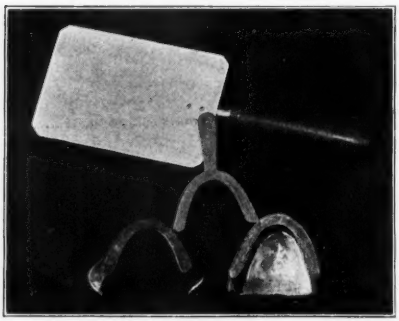
heat when pooling the wax and setting up the teeth. These bite plates may be burnished to the cast or, in difficult cases, swedged. Wax ridges are placed on them to complete the base plate, before taking the bite and are made to conform to an arch-shaped gauge which

insures their proper relation to each other when taking the bite.

TAKING BITES.

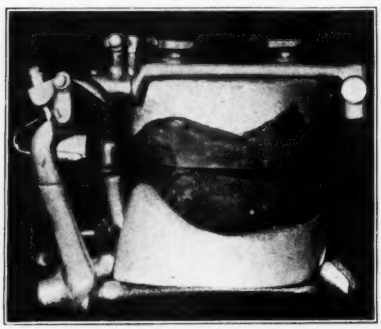
The upper base plate is placed in the mouth and the lip length determined, then the plate removed and trimmed to conform to the lip length and occlusal plane.

Figure 11.



Shows wax bites made on metal base plates; also bite gauge and hot plate.

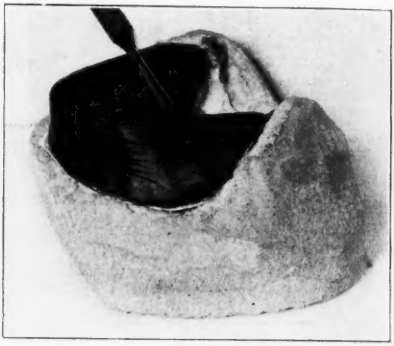
Figure 12.



Shows wax bite plates on casts.

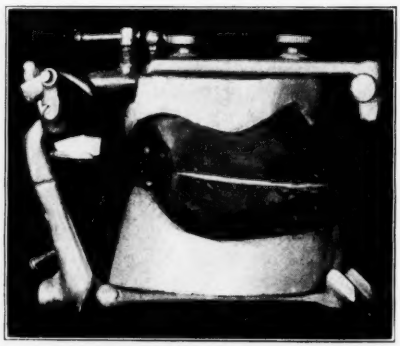
The lower base plate is then placed in the mouth, the lip length determined and marked on the wax. It is then trimmed in the anterior portion to the line marked for length, left higher in the posterior region than in the anterior so that when the bite plates are placed in the mouth together, the strike is first in the posterior region, thus keeping the planes apart about 3-16 of an inch in the anterior region. The lower bite plate is then removed and, with a heavy hot spatula, the wax is pooled to a watery consistency by imbedding the hot spatula deep in the wax and passing it back and forth, from about the location of the lower lateral incisor to the posterior end of the bite plate. This is done on both sides of the lower bite plate, never

Figure 13.



Shows pooling of wax of the lower bite plate for taking bite.

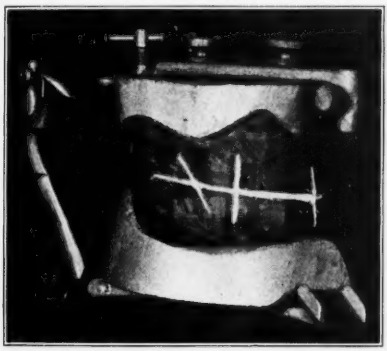
Figure 14.



Shows bite plates closed together after pooling of wax.

allowing the hot spatula at any point to melt the outer surfaces of the wax, leaving them standing as soft shells, forming a trough to retain the melted wax. The lower bite plate is now placed in the mouth and the patient instructed to bring the lips together, thus causing the bite plates to come together in their proper relation, the hard wax left in the region of the lower incisors automatically stopping the jaws at the proper rest point. It is safe to assert that the jaws will never be too close together if this method is used; it does not confuse

Figure 15.



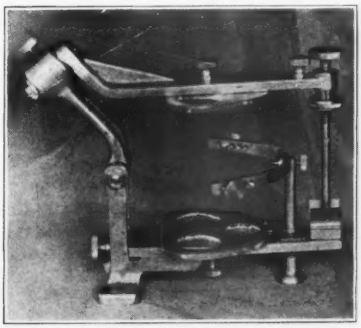
Shows the right and wrong way to make marks for testing bites.

the patient, eliminates the liability of excessive pressure on either side of the mouth, thus removing one of the most common faults in our procedure of construction.

It is now necessary to examine the patient's profile, general contour of the face, and in particular, the appearance of the lips at rest. Proper facial contour should be established at this point and if advisable to close the jaws, to get the proper appearance of the lips, all that is necessary to accomplish this, is to remove the lower bite plate from the mouth and cut a notch out of the wax from lateral incisor to lateral incisor inclusive and to a depth from 1-32d to 1-16th of an inch or whatever is deemed sufficient by the operator, to give a proper length of bite, or the working bite.

Re-pool the wax and proceed as be-

Figure 16.

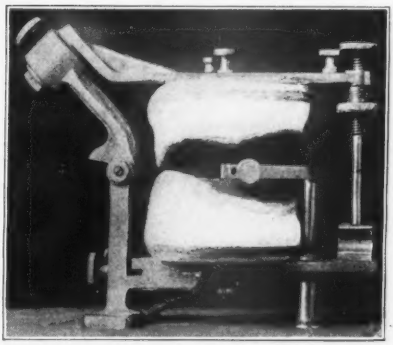


Hall articulator with Jig for properly mounting Casts.

fore, then mark the median line and carefully test the bite.

This procedure first described by Dr.

Figure 17.



Case on Jig in Articulator ready for mounting.

Greene in his method of taking bites, (altho he used modelling compound instead of wax) gives the operator absolute and scientific control as to lip rest line and proper facial length.

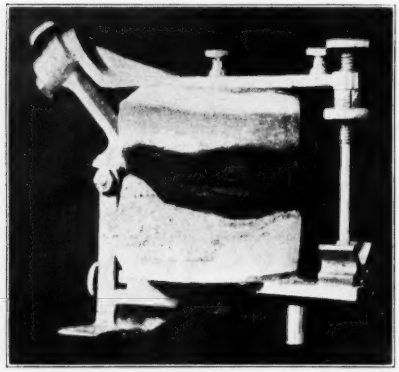
In my experience this method, used in

connection with the jig designed by Dr. Hall for mounting cases in his articulator (according to the Bonwill measurements of the equilateral triangle) obviates the use of the face bow.

Mounting of Casts.

These casts are mounted in the Hall articulator according to Dr. Hall's method by setting the center pin of the jig at the median line and occlusal plane and the posterior pins in line with the occlusal plane.

Figure 18.



Case mounted on Articulator.

Setting Up of Teeth.

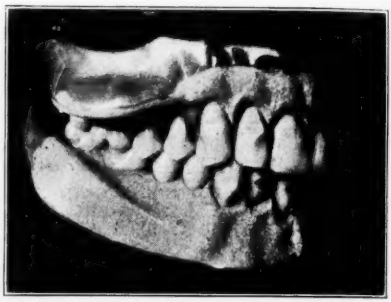
Volumes have been written upon the proper alignment of teeth, altho I use a simplified technic for this work, the time allotted to this paper will not allow of its presentation. Under the circumstances, I can do no better than to refer you to Prosthetic Articulation, published by Dr. George Wood Clapp for instruction as to proper alignment for the setting up of the teeth.

Waxing Up Teeth.

This is a feature of the work which must be accurately and carefully carried out for with the facial contour properly re-established with bite plates, we are enabled to place the teeth so as to obtain the best effect,—that of naturalness.

The thickness of the upper plate is obtained by the use of the 20 gauge

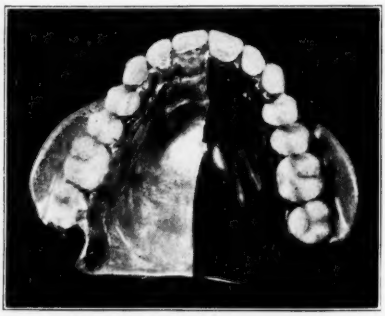
Figure 19.



Properly waxed case ready to tin-foil and invest.

metal used in the bite plate with an additional thickness of Kerr's Cast Gold Wax, 28 gauge; a second thickness of

Figure 20.

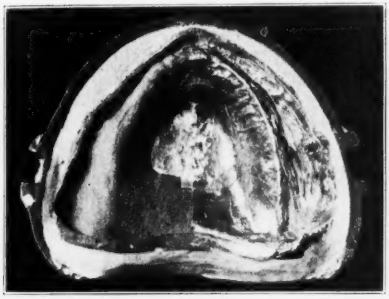


Shows method of tin-foiling palatal surface of plate when properly waxed for investing.

the same wax is used where metal relief is indicated for hard tissues. A No. 60 tinfoil perfectly conforming to this surface of the plate is then burnished over the palatal portion, leaving the edges higher than the occlusal surfaces of the teeth to engage in the plaster when invested.

The case is then invested and when packed, a relief of the hard areas on the cast is made with No. 60 tin foil and the entire surface of the cast covered with a very thin tinfoil made for this purpose. The tin covered cast is then

Figure 21.



Shows relieving hard mouth surfaces with metal and tin-foiling cast before vulcanization.

soaped, the flask closed and the case vulcanized.

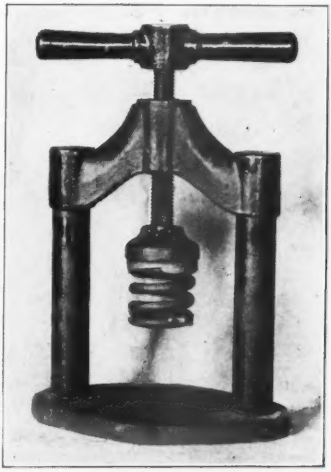
By this method the greatest density and strength and the utmost elasticity of rubber is obtained, as it is vulcanized between metals and uniform palatal

Figure 22.

Shows comparison of vulcanization between metal and plaster.

thickness made thruout, thus eliminating the danger of warping in polishing, as both palatal surfaces of the plate come from the vulcanizer practically finished. Of inestimable advantage to the patient, is the fact that in this treatment of the rubber, nature is so closely simulated that the least irregularity of surface is reproduced and the patient relieved from

Figure 23.



Shows spring press for proper pressing of rubber before closing flask.

the discomfort of the ordinary thick, smooth palate.

Figure 24.

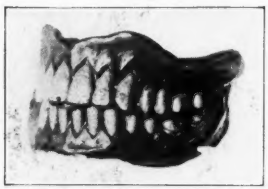
Lower Plate with wax on ready to take test bite before regrinding.

Taking Test Bite for Re-grinding and Balancing of Dentures.

Taking the final test bite with finished dentures in the mouth, re-mounting on anatomical articulator and grinding to all the movements of the mouth with carbo-

rundum paste, make it possible to obtain a degree of accuracy and efficiency in occlusion and articulation never hitherto accomplished. This method, in connection with the incisal guide pin and cup as advocated by Dr. Hall, has made

Figure 25.

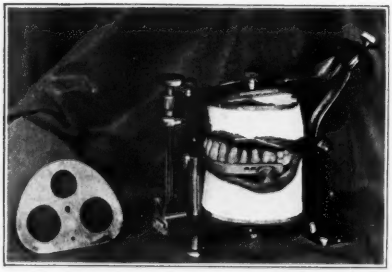


Shows plates after taking test bites preparatory to grinding teeth for proper balance and articulation after vulcanization.

possible the advanced and unheard-of efficiency of the deep cusp teeth.

We may readily see how slow we have been to receive and perfect the good things offered us by early geniuses in our profession by referring to the treat-

Figure 26.



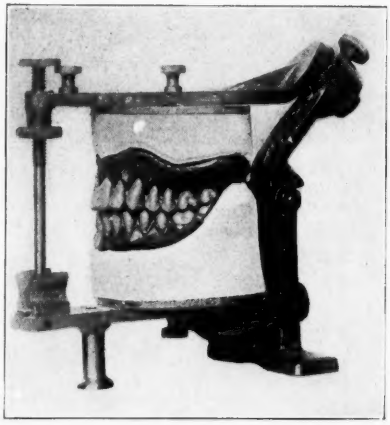
Use of jig in mounting for regrinding.

ment of this subject by Dr. Greene, whose book was published in 1910. This was years after the invention of his novel scheme for re-cutting the occlusal surfaces of the teeth by mounting the finished dentures in the articulator and working them together, with carborundum powder placed between the teeth, for the purpose of cutting out the bumps and inaccuracies.

TEMPORARY PLATES AND DUPLICATION.

In closing let me call attention to a most satisfactory technic employed for reproduction, where cases present for full dentures before the extraction of the teeth has been accomplished. A plaster impression is taken of the mouth prior to extraction, a record made of the patient's name, address, telephone num-

Figure 27.



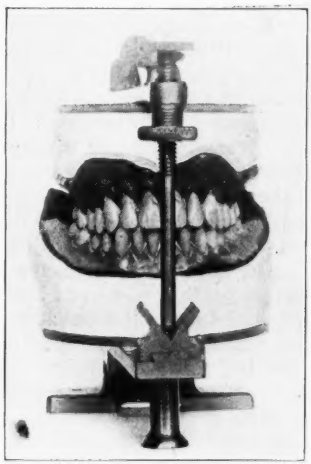
Shows plates mounted on articulator for grinding.

ber and the shade of the natural teeth; both impression and record are filed. After extraction, the teeth are boiled and cleaned, placed in the plaster impression and a plaster cast made which retains the teeth in their original position. These casts are also filed and kept for the purpose of duplicating the tooth form, arch form, fillings, crowns and irregularities and are helpful aids in the reproduction of grooves and pitted surfaces, as well as for staining and shading the porcelain teeth for the denture to be made. They thus serve as guides for the building of both temporary and permanent dentures.

A surgical procedure is employed in the preparation of the mouth after extraction as originated by Dr. Carl D. Lucas, of Indianapolis, and presented by him in a paper before the First District Dental Society of Michigan and later published in the Michigan Dental Journal in 1916.

This procedure makes it possible for people to wear temporary plates with great comfort and satisfaction, after six

Figure 28.

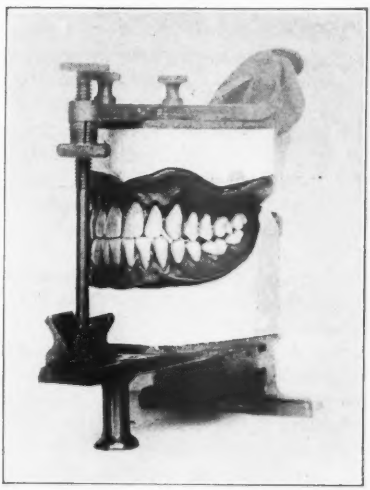


Shows position for first grinding to balance in rest position.

or eight days from the time of extraction and their mouths are then as smooth and free from prominent points and undercuts, as they would be without this surgical preparation in four or five months.

In cases of people in public life who would be greatly inconvenienced by being without teeth for even this length of time, the following procedure is used: all of the teeth posterior to the cuspids are removed and the mouth surgically treated and allowed to heal for a week or ten days. Impressions and bites are then taken as for partial plates, the cases articulated and the teeth selected and ground to duplication of form. The upper central is then sawed out of the cast and the cast carved, so as to

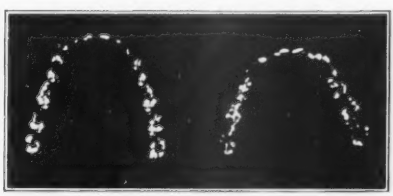
Figure 29.



Shows position for grinding to proper balance in protrusive bite.

permit the artificial tooth to be set in the same alignment and position as the natural tooth. Working from the center in

Figure 30.



Shows comparison of occlusion taken from a mouth with perfect natural teeth and artificial dentures made by method given in this paper.

each direction, all the teeth are treated in the same manner both above and below, making complete artificial dentures. After these dentures are vulcanized and finished, the patient is called, the re-

maining natural teeth extracted and the mouth surgically treated. The dentures are then fitted to place and the patient leaves with dentures comfortable to wear while the healing is being effected.

In all upper cases of this kind we use a large size Eureka Suction as no anterior gum is put in these cases at this time.

The patient is instructed to return in six or eight days for the removal of the sutures, at which time, with the denture held firmly in place, an impression is taken of the anterior portion of the mouth where the gum was omitted. The impression and denture are then removed, the Eureka rubber taken off and a cast is poured into the denture. A front is waxed in, flasked, packed, vulcanized and finished. The stud for the Eureka is then cut off and the temporary plate is complete.

The same technic is employed in the lower case with the omission of the Eureka.

I have found this method very successful and highly satisfactory to the class of business and professional people referred to above.

Discussion.

W. M. Randall, Louisville, Ky.

The time for discussion has been cut short, and I will not go into the discussion which had been anticipated.

There are a few things or thoughts in the matter of digesting the subject which was presented to us yesterday afternoon, which occur to me more as a matter of history in prosthesis than as strictly technical work.

It seems that this department of our profession at this time has a responsibility before it that it never had before, and which certainly no other department in our practice at the present time, involving the foci of infection propaganda, and the restoration work in the mouth, has ever had before, and that we should certainly arrive at a more definite viewpoint and a more widespread standardized technic, as a whole profession on this subject of denture or plate construction.

It is true, each man is going to put his individuality into the work and he is going to vary somewhat on little technical points, but the main points, namely impression taking, articulation of teeth, bite measurement and a point which was not brought out in the discussion yesterday, but one which in my own mind is equally as important as any of those three fundamental and important steps in denture construction is the vulcanizing technic, and the finishing process.

Let us consider in a reminiscent way, if you please, what has been done in the last twenty years in the way of standardizing the technic in plate construction. Take Dr. Bonwill as the beginning of anatomical articulation. The profession at that time recognized Dr. Bonwill as a heroic technician, a man who was promulgating ideas and bringing about a standard that no average dental practitioner would ever perform.

We later had the Snow method, and all of its technic of anatomical articulation, the Walker technic, the Christensen technic of taking bites, and bite measurements for mounting on the articulators. We have the several different types of articulators, and Gysi technic, and now the Hall.

What does it mean? All of these different standards of technic which have been advocated by these men during the last twenty years, are to the present time being practiced, some more than others, and some longer than others. All have something good in them. Some have more good things about them than others. Some of the very best points, as I see it, in some of these methods of technic are being entirely overlooked in the average practice and the entire method is being discarded as absolutely no good, because most of it did not happen to be good.

It seems at present that it is high time

that while all of these things may not altogether be good, yet most of them have some good features. It is a question of getting together. It is a problem of giving and taking, and being willing to sacrifice a little, something here and there in order to get at what might be recognized as the standard type of technic, that the average practitioner in dentistry over this country may perform to his own satisfaction and to that of his patients, that we might do the greatest amount of service to the profession, and more important than that, to humanity at large. That is our duty. We are not going to do the greatest good to the greatest number until we have arrived at a more universally recognized standard form of technic that the average practitioner of dentistry can perform. That, as I see it, is our most important duty at this time.

The manufacturer and the laboratories have had their part in the development of prosthetic dentistry. They have played no little part in it. But we all realize at the present time that we have a responsibility in this regard that we never had before. Let us get busy on our individual and community, study all over this country and not leave it to one or two or four or five men who are more especially interested in this work, but every fellow get to work, and the multiple community will result in a good that we have never had before in this line of work.

I know there are a number of men in this country who are interested in prosthetic dentistry and who have never given it any special line of thought or effort, who can have some good results and good clinics and hold out very much good in the matter of assembling some of the good points of these different types of technic rather than taking up a special line that may not altogether be good, and it would be a great deal better if it had some things out of it in an extreme way, and some other things injected into it from other methods.

I have especially given some study to the Gysi method of practice and the Hall method. I think both methods have some mighty good things in them, and for all cases in my own experience, either method is not absolutely perfect. That is to say, that you can not take every patient and every mouth that comes along and get universally the same results, at least I have not been able to do so, altho it has been claimed by some of our men that with the Hall method, in the matter of efficiency in masticating food, it is universally satisfactory.

I believe the face bow indicates a more or less irregular position of the condyles where the condyle is lower on one side than the other, and there is an extremely abnormal position of the condyloid processes, as related to each other, in the horizontal positions; I believe that the face bow does some good, in mounting our cases on the articulator, and that we do get a more accurate antagonization in the mouth.

The longer the triangle from the condyle to the median line in proportion to the base of that triangle, in my own experience, the more necessary it is that we should modify in the Hall method, the depth of the over-bite and cusp. In other words, our older patients—it is true they get used to it in time, but when the dentures are first placed in the mouth, it is more difficult for them to become accustomed to them—especially if they have ever worn dentures of a different type, than it is if the face bow measurements are taken and the depth of the cusps made in proportion to the difference between the length of the triangle and the breadth of its base. In other words, the younger our patients, in the majority of cases, the shorter the equilateral triangle and the greater depth of cusp they will stand, and the longer the triangle, as the patients get older, the more shallow cusp, not a flat nor even a mediocre one, but somewhat

modified from the extreme condition, as we saw it in the cases yesterday—in my own experience has proven to be easier for the patient to become accustomed to wearing it than if the extreme cusp is made.

My time is limited, but I would like to bring up a point in the technical construction regarding the bases. I want to say at this point that we believe conscientiously that the greatest salvation is going to come thru metal bases. Our old pioneers, back in the twenties, thirties and forties, received fees for their efforts that we have not been able to get since rubber came into use. It will serve the same purpose in resurrecing the old methods along that line more than it did before that time, and it will get us back into something which will pay us for our efforts. If we are going to make the very best dentures in vulcanite, there is a type of technic that I personally believe is important to us. We all recognize the strength of plaster, and plaster is more or less affected by the egress of moisture, and still the majority of us insist that we should boil our plaster to remove the wax, and boil it and heat it and press up our vulcanite; and what are we doing? We put it in the vulcanizer and vulcanize it, and immerse it in water, all the while saturating that plaster, and weakening it the more it becomes saturated.

For several years it has been recognized that plaster becomes stronger and stands more pressure as it becomes dried out; and I have used what is called the dry heat technic, a method of dry heat, using Wilmot's sterilizer. There are different methods of doing it—where you can shut off the steam from the water and have a chamber of dry heat. Put the flask in it and leave it at a certain temperature, which is registered by the thermometer; and when it reaches a certain point, the wax can be removed en masse and the flask is separated, and only the minimum quantity of boiling water—with tin foil next to the plaster —will remove all the wax from the pins. I then use dry heat in warming the plaster previous to packing, and get the plaster thoroly dry. And when you pack the vulcanite against the warm moulds of plaster, it will lie just where it is put, and will remain there. You can more accurately pack. There is less excess of vulcanite. The plaster is getting harder all the while.

I prefer a vulcanizer which will keep the flask out of the water, free from contact with anything other than superheated steam above the surface of the water. In getting anything like an accurate registration by the thermometer, all the air should be expelled from the vulcanizer, and in vulcanizing the rubber should be out of the water, and with dry plaster in the flask, pressing it down and closing the flask completely, not at 212 but at 248, which is recognized as the fusing point or the most liquid state of vulcanite.

With this technic, with that maximum of the plaster in the flask, we have the minimum resistance offered by the vulcanite; we have the most perfect adaptation that can be obtained in the closing of the flasks.

The result is a less risk in change of the position of the teeth, the articulation of which is carried out so accurately, as was shown yesterday; and we do not want to run any risk.

I would suggest that you try this type of technic in carrying out the rubber cases. I am sure it will be most satisfactory to you in most cases used in conjunction with the tin foil on both sides of the vulcanite. There is a great deal in the strength of vulcanite, in its texture and in its elasticity, in the process of vulcanizing, which I could not attempt to describe at this time.

I want to commend everything which was given in Dr. House's paper. He is a most excellent operator and his type of technic will stand the test of time. I

do not say that it will do so in all cases, but it is worthy of your trial.

Norman S. Essig, Philadelphia, Pa.

After having listened with much interest to Dr. House's paper I conclude that as far as I am concerned, I can put my seal of approbation on the great bulk of its contents, and the points upon which I could differ are not sufficiently important to take the time away from the vital features of his essay.

It is not my purpose to dwell on the dental traditions and history which have been touched upon in the beginning of the paper, nor will it be necessary for me to go again into the subject of impression taking, except to say that for many years it has been my custom to make an especially swaged cup for each case that presents itself to me.

The method described today presents many advantages, except in some partial cases, especially in the lower mouth, and here the specially swaged cup, made either of air chamber metal brass or some material that is adequate for the purpose, can be used to better advantage. The principle, however, may be looked upon as identical, and the method described by the essayist as an evolution, being far in advance of any other in use for entire upper and lower cases.

The combination of an impression tray comp. and plaster of Paris is ideal, and the range of possibilities offered is unlimited. So that I can strongly advocate this method after having adopted it in my practice.

Impressions taken after the manner advocated by Dr. House places in the hands of the prosthesist, a plaster model which is absolutely accurate, and furnishes the foundation for a plan which should be marked upon the plaster model, and strictly adherred to thruout the consequent stages of the procedure.

Too much stress cannot be laid upon this plan, which should be drawn upon the model in blue pencil, after giving the case careful study, especially in partial cases where clasps are to be used to give all or a part of the stability required. We are still far from a point where we can afford to dispense with this means of attachment, or allow it to become a matter of dental ancient history. In fact, partial dentures should at this stage of dentistry be assuming their proper place and importance in our efforts to serve our patients, and here let me say that I am firmly of the opinion that the clasp, and the partial denture went out of use, in a broad sense, because they were too difficult to make, requiring too much time and skill to produce in metal, a swaged denture of a high standard of precision and excellence.

In view of the fact that as root work is not only an expensive procedure, but the number of roots which can be filled ideally are limited, we must have recourse to some satisfactory method of replacing lost organs of mastication, that those who are not in a position to spend large sums on removable bridges may also be served satisfactorily.

This can be done by means of the partial plate of metal or rubber, together with an oscillating clasp which adjusts itself automatically, and brings no stress upon the teeth which serve for the purpose of stability.

I have devised quite an assortment of varied forms of clasps, having a reciprocating or compensating form of movement, and these I find are a wonderful source of comfort to the patient, who is rarely conscious of this form of attachment, even when worn for the first time.

Let us stop at this time to consider just what is demanded of us. What is Prosthesis, and what is the nature of its component parts—and wherein have we fallen down in the past—and why? Let us begin at the first and fundamental step.

How many men systematize impression taking, or have anything but a

vague idea in their heads when beginning a denture of any kind? This is unlike any other department of manufacture, especially when the product is to perform an unusual service, composed of many intricate steps, each of which depends upon accuracy of the preceding one for its success, the finished product evolving itself into a work of art embodying facial restoration as well. This, gentlemen, is a very important service, involving all the artistic skill and talent we possess, and it should have its plan and specifications just as any other product in art and science.

We should not permit ourselves or others, whose finger skill is employed upon such work, to deviate from this plan. The success or failure, however, depends upon the accuracy of the impression. Therefore, the impression and the plane are the fundamental steps in the production of a denture of any kind.

This may require additional time, but the results will warrant it. Therefore, do not let me hear any one say that they can't charge enough to compensate them; for each man will get just what his work is worth, if he takes that stand in the beginning.

It gratifies me to know that many of the principles of Prosthetic Dentistry, that I have always regarded as vital to that branch, have been advocated in this paper.

Details in the construction of an artificial denture, which seemed destined to be spoken of but lightly in our textbooks, have been given the prominence that is justly their own. I believe, I have also had a hand in keeping some of these alive, and rejoice in the fact that others have been working along similar lines.

Broadly speaking, the essayist has outlined to us today a systematic, standardized method of impression taking, the different steps of which are in logical sequence. It is the inevitable evolution which generally appears when interest, etc., are at a low ebb.

The swaged trial plate and the record model, the finished temporary denture, made before the extraction of the teeth, I have used and have advocated all my professional life, and I am keenly alive to their importance, both to the operator and the patient. I believe I am one of the few men who has a collection of record models of an entire practice.

Facial restorations are so dependent upon these record models that their importance cannot be measured. The advocation of this procedure was the subject of the first paper I ever read before a dental society.

I have been in the habit of making my temporary denture before the teeth are extracted, and have frequently had my patients come directly to my office from the extractor, to have the denture adjusted, if, indeed, adjustment was necessary.

After the shrinkage has taken place to the extent that the temporary piece becomes loose, I have but to use the plate as an impression cup, and run a bite over the teeth to insure their accurate replacement, and remake the plate. This is simple, easy, and very quickly done.

We must also remember that we are dealing with something that together with all that is found in juxtaposition to it, is a law within itself. The oral cavity, and each case that falls to us differs tremendously in its detail from the preceding one. This fact precludes the conventional, and forces us to treat the subject in a special way.

In the discussion of this paper, I feel that I shall not digress beyond the pertinent, if I treat the correctable method of impression taking as an eminently satisfactory one, filling a tremendous want, and bringing about a degree of accuracy hitherto unknown, and continue from this point along the lines which seem to me not only pertinent, but also requisite and necessary, lending itself and dove-tailing into the method described to produce the greatest results.

After taking the impression, and evolving the plan for the type or form of denture, our next step is the selection of the teeth to be used to replace those which have been lost, and restore the harmony in the mouth of the patient.

My purpose is, therefore, obviously to connect at the point to which Mr. House has brought us certain other steps, because I feel that by so doing I can contribute to a sequence of events, productive of wonderful results, and because this phase of the subject can no more be neglected than can the taking of the impression.

One word regarding the so-called anatomical articulator, and where its real place is in prosthetic dentistry. I am strongly of the opinion that we have been trying to mystify ourselves in the past, and have been looking thru the wrong end of the telescope in our effort to get at the facts.

As has been said, the bony structure, the articulating and functioning process of the maxilla and mandible, differ so widely in each individual case that it would be unscientific, to say the least, to try to place every one upon the same basis, inasmuch, as each patient brings with him his own truly anatomical articulator; why not make use of it to our own end? The only thing we demand of an articulator is that it maintains during the absence of the patient that which we have attained directly from the mouth of the individual.

I believe Dr. Hall's articulator will reproduce every movement the patient is capable of making, and some that cannot be made by a particular mandible. Furthermore, it is to me the pleasantest instrument upon which to work out the problem of articulation, on account of its great simplicity. The mystifying face bow, and the search for a condyle path, is beginning at the wrong end of the procedure, and completely ignores the importance of the occlusal planes which are peculiar to the individual patient.

Let me lay stress upon the fact that to reproduce nature, and supply to our patients artificial substitutes which will at once be satisfactory and artistic, is not an easy or simple task.

The processes of nature in the same sequence must be maintained together, with and following an accurate method of taking an impression, which in turn must have subjoined to it a plan and set of specifications, so that the original ideas conserved by the prosthetist may be preserved and carried on to a satisfactory conclusion without deviation, especially when much of the actual technic may be in the hands of those who never see the patient.

In other words, the plan is to place the selection of artificial teeth, and their manipulation, both before and after their adjustment in the human mouth, as nearly as possible on the same basis as the natural teeth, and their evolution and development of form and arrangement in the human skull. Therefore, the formula for the method employed to bring about results of the greatest value and highest order should follow along and compare with the true scientific and physiological laws in order to produce by artificial means, results commensurate with those obtained by the processes of nature. Thereby a synthetic form and outline is obtained, bearing a direct relation to the combination of basal types, but retaining its greatest relation or resemblance to one of these which we call the base.

Again, like any other creative process, there must be a basis of operation upon which the structure is to be built, and which in turn is to form the basis of subsequent calculations. This is also true of the development and eruption of the natural organs of mastication. It would, therefore, be most logical to ask ourselves the question: Upon what *does* nature base her system, and what physiological process maintains in the nor-

mal human being with regard to dentition?

We find that the capsule from which the human teeth are formed, develops, matures and pushes itself into place, governed and limited by the surrounding bony walls within which this development takes place, and that the size and shape of the fully developed tooth, and its final alignment, is dependent largely upon the space allotted to it, together with the influence exerted by cusp formation. This is especially true in the case of lateral incisors, which are more likely to bear little relation to the type represented by the centrals.

Even a superficial summary of a part of Nature's methods will more than account for the fact that the human teeth are a law unto themselves, tho this digression eventually becomes almost rhythmical in method and recurrence.

It has been established as the result of systematic research that the teeth of man owe their present form to the blending of three primal or basal types, which in their purity conform to the rectangular, pyramidal and rhomboid, and which may be found thruout the world, regardless of race or environment.

Having taken these points into consideration, let us see how we may apply these conditions to the results obtained by the correctable method of taking impressions, and to the formation of porcelain teeth, and how absolutely dependent it all is on our ability to obtain a perfect impression.

In the selection of porcelain teeth for an artificial denture, especially in the case of edentulous persons, much time must be spent in the contemplation and analysis of the face. No man can quickly scan the face of his patient, and conclude at a glance just what type and arrangement is indicated. Therefore, any method which holds out such ideas, is misleading to say the least.

Any one who has been deprived of the natural organs of mastication for any length of time has generally worn artificial substitutes, and it is, therefore, always advisable that a consultation appointment should be given with the idea of studying the face, and noting the requirements of the case in order that a readjustment or a harmony be reestablished which will blend the arrangement of the artificial teeth with the lines of the face so that attention shall not be attracted to the fact that there has been a dental service.

It is undoubtedly true that often it is desirable, or that a face demands the use of a blending of the basal types to produce the required harmony. It is also true, alas, that this fact in many instances is either not recognized, or it is disregarded altogether in the selection and adaptation of porcelain teeth.

We may conclude that if we ourselves are to produce appropriate blendings as a result of the study of any given face, we can do so to a much better advantage by starting the procedure with a strong and pure type of tooth, and specializing a modification to suit the case. This is only what has taken place in the original condition, and many times what we regard as a harmonious condition is but a countenance whose identity has become established by reason of the natural arrangement of the teeth, and effect they have on the face and its expression. Therefore, while we must not neglect the individual tooth and its anatomic variations, we must regard the six anterior teeth as a unit. This is how nature has been able to use any of the three types whenever she pleases and still produce or maintain harmony.

Experience has taught us that nature at times disregards all rules, tho as time goes on there is a very apparent effort to readjust or harmonize the conditions by what may be termed an automatic readjustment, or an effort on the part of nature to harmonize. But when mere man assumes to supply these most important organs the task becomes more than complex, when all phases are con-

sidered, if it is to be done as well as possible.

If the study of bacteriology, or any other department of science, has been carried on with the same disregard of principle and detail as is noticeable in some of the departments of dentistry, we would, without a doubt, still be groping in the dark, and many of the wonderful results which have been attained and applied to the relief of mankind, would be still on the list of future discoveries.

A complete analysis of a face must be made to create a harmony of line, even tho this harmony be later distorted in the adjustment of the mouth, if we are confronted with deformity or physical limitations which may or may not be disfiguring, or again a condition which is often more difficult because there is no deformity at all.

These variations from the harmonious and symmetrical are what may be designated as "harmonious discords," and can only be recognized by the establishment of a bilateral symmetry accomplished by the comparison of the two halves of the face between certain established lines. Therefore, that portion of the face which is most characteristic, and at the same time nearest to the teeth themselves, should be selected, because this area is less affected by high lights, shadow, or style of wearing the hair, etc. The discordant element which enters into the question must be applied after harmony has been recognized.

For this reason the area I have established for my convenience, is from the eyebrows to the comsure of the mouth with the median line vertically thru the nose at right angles with the horizontal lines, which are parallel to each other.

It should be borne in mind that what we often select as an example of harmonious discord, or an individuality is but the result of a digression from the symmetrical and ideal, and the effect that such a condition must necessarily have on facial expression. Therefore, if possible, it is our function to restore this unusual or characteristic individuality, and like all reproductions of Nature, it is an art of the highest type.

If it is not possible to restore the mouth to what it was originally, we may serve the patient and do ourselves credit, by restoring the organs of mastication in an alignment of the teeth, similar to that which is in the mouth of some one else, provided we do not distort or disfigure the lines of the face by so doing.

The patient will have to get accustomed to an unusual condition in any event, so that our efforts should be directed along artistic lines, and the old conventional regular alignment be discarded.

I should like at this point to revert to what I said regarding digressions from the harmonious. This particular phase of the subject sometimes becomes almost a local or sectional characteristic, and proclaims at times the part of the country from whence a person comes. This is amply exemplified in those coming from the north of Ireland, where a peculiar wedge-shaped arch and overshot appearance is more than common. This peculiarity, however, may embody any of the types.

The two central teeth which may be said to establish the type indicated should be in conformity with the portion of the face confined within the lines described. And not only should the outlines suggested by this method be adherred to, but modifications of profile of the teeth should also be made to conform them to the general contour of the face.

A very logical explanation for the great variation in the lateral tooth, and the fact that in many instances that tooth does not maintain the type of the central teeth, is that in its developmental stage the room allotted to the capsule is often curtailed by reason of the robust character of the central incisors and cuspids. So that it might, therefore, be said of this tooth, that at least a part of its function is to fill the space between

its more vigorous neighbors, and also to blend or harmonize the lines of these dissimilar teeth whose form and function is widely different.

There is, of course, a typical lateral to be found in well developed dentures, which is an ideal companion to the truest type of central, where development has been ideal and uniform. Harmony, however, is not marred by the insertion of any type of lateral whose width is appropriate, and individuality is often obtained by modifying the lateral incisor to suit the case in hand.

The cuspid or canine tooth is a most important one, and great character or a lack of it, can be produced by the appropriate placement of these teeth, which no doubt have more than one function to perform, apart from the fact that it has its use in the preparation of food, or, in the lower animals, as a weapon of offense or defense. It is also a great stabilizer, and by reason of its strong roots acts to reinforce the arch at a point where the roots of the adjoining teeth are widely different. Therefore, in maintaining the sequence of events, and the ideas around which these methods have been established, a typical and robust form should be adopted so that modifications at any point may be made, and the harmonious darping of the six anterior teeth maintained and completed.

Heretofore, we have been in the habit of filling a given space by selecting six anterior teeth with appropriate bicuspids and molars to suit the case. As a matter of fact, artistic effect is greatly increased by selecting the two central incisors separately, with a view to type, and the two cuspids which shall denote character, and after having aligned them on the arch, a modified lateral placed in position whose proportions are governed entirely by the space left, because by so doing we have only done what Nature does.

Inasmuch as artificial teeth of porcelain are the means by which we reproduce the natural organs of mastication which are designed and arranged by an all-wise Creator, whose plan thru it all has been modified by man thru his failure to observe certain laws. We would do well to follow this sequence and plan in the system by which we select and arrange our porcelain substitutes, because we have to restore a condition, the responsibility for which must ever remain with that Supreme Designer, whose method will forever maintain, and whose wisdom we may not dispute.

Reverting to the discordant elements which must evolve in the process herein described, it might be well to dwell upon that phase of prosthesis a little more in detail.

We have said that harmony should first be established. This is true according to our formula, and is verified by the examination of cranea which shows clearly the natural, physiological process.

Orthodontists claim that there is a method of calculation which will produce the normal arch and alignment in each case that presents itself. This would lead us to believe that nature established a harmony, and then departed therefrom. Let us, therefore, do the same. Let us select the teeth with a view to a certain distortion later which shall conform to the irregularities which confront us. We select the types we desire from any of the three basal forms, and consequently regard the face of our patient with the view to distort the form and alignment of the teeth selected, so as to produce a harmony of line and contour in keeping with the face, regardless of how irregular it may be.

We must determine whether we wish to produce an appropriate degree of age and wear by cutting the tooth at the incisal edge, by exposing the neck, or by a compromise of both.

It is only in rare instances that there is not considerable elongation in elderly persons, and unless there is a marked over-bite, occlusal wear is manifest to a greater or less degree. Approximal wear while not so apparent, is generally evi-

dent upon close examination of those fifty years of age or older.

The foregoing may be classed among the discordant elements in the process by which we will endeavor to keep pace with Nature.

The use of the articulator is of great service, provided our instrument reproduces and maintains the movements established by the mandible itself. It is capable of producing an occlusal wear by persistent attrition like that which occurs in the mouth, and which is limited and influenced by the habits and physical capabilities of the individual.

These movements are also controlled by the bicuspids and molars, and the radius of action permitted them by their cusp formation and general alignment, which either allows or precludes clearance laterally.

It will be noticed, when we examine a mouth having a good articulation, that wherever a tooth has a marked projection in cusp formation a compensation for that prominence is made in its antagonist by an indentation, or a semi-approximal surface which is shared in good proportion by the two opposing teeth, forming little occlusal planes which are separated by the triangular ridges typical in bicuspids.

It is just as much a part of our plan to follow nature at this point as in any other. Therefore, we must again reproduce natural conditions by making our masticating teeth also a reproduction of nature with all the proportions to the smallest detail of their formation.

Reproductions of this kind in porcelain produce the most wonderful results, and such teeth are free from the interlocking feature which is most objectionable to most patients. They also have a slight inter-occlusal space, due to cusp formation, within which food may be held in small quantities without keeping the jaws apart during mastication. This feature allows the patient to thoroly masticate, not merely mash or bruise the food.

Let me again lay great stress upon the fact that the one dependable and truly anatomical articulator is the combination of the upper and lower jaws of the patient. Inasmuch as great variation of form of the boney structure of the human head maintains in the human race, the individual, as he presents himself to us for a service, furnishes us with our only true guide to the correct relation of that particular mandible and maxilla.

The articulator must, therefore, be only an instrument to maintain movement and relation in the absence of the patient.

The jaws of an edentulous person have no path or track upon which to functionate or to guide them in mastication, as is the case with those who have not lost their teeth. Therefore, while it is possible for any one to get accustomed to an inferior form of denture, and in time get some degree of service therefrom, our plain duty is to come as close to the natural state as we can by following Nature. The results are just the difference between good results and results that are deficient. My experience has been that a greater degree of perfection is attained by following the methods employed by Nature in the creation and development of the organs of mastication, and the way they are placed in the mouth of mankind.

Dr. William A. Giffen, Detroit, Mich.

I understand that we are trespassing upon the time of the other division of this Section.

It is important for the welfare of the National Association that this Section be arranged properly each year, and that the program be given proper attention, and that proper officers be elected, to get the best results for the dental profession. The election of officers has to take place before the next division of this Section comes on.

So I want to assure you that I gave to the paper of the essayist due consideration; I studied it carefully, and what

in my humble opinion was the right thing to say, I have put down on paper. It will be published probably with the other discussions in The Journal of the National Dental Association. Those of you who are interested in this subject—and I see there are many; I never saw such a fine audience before. It looks as tho this phase of dentistry is going to receive a great deal of attention in the future—you will be able to see it in The Journal when it appears. I am not going to take up any of your time. We have received a great deal of information.

There is one thought I want you to take home with you, and that is this: there is not any short cut to the successful making of dentures. You must arrange a definite technic if you expect to receive the most accurate results possible, and the thing for you to do is to work it out for yourselves. You have Dr. House's technic, and there are many others which have been given here, and which have appeared in The Journal in the last few months, in the National Journal and others; so that when we come next year we will try to have a more systematized method of procedure. I thank you, gentlemen, for your attention.

(The discussion referred to by Dr. Giffen is as follows:)

I feel very much pleased, and in no small degree honored, by being called upon to participate in the discussion of such an important phase of dentistry.

After preventive dentistry, denture construction is next in importance—a fact which our profession is just beginning to realize. Many more teeth are being condemned than ever before, and the fallacy of long fixed bridges has been recognized. There is a growing demand for full and partial dentures, which a large majority of dentists are incompetent to supply, except in a very rudimentary and crude way.

One of the two principal reasons for this state of affairs is that the general practitioner believes that the fees usually obtained for this work are inadequate.

Dr. House fully eliminates this reason in his statement, that the thing to do is to prove to your patients that you are doing a better class of work than you are getting paid for.

The other principal reason pointed out is, that the majority of dentists do not know how to get accurate results.

Dr. House is eliminating this reason by laying down a systematic method of technic for denture construction, which, if followed, will enable the dentist to get accurate results.

It pleased me very much to see Dr. House give the men who "blazed the trail," credit for what they have done towards converting the art of constructing artificial dentures from a difficult and uncertain branch of dentistry into an interesting, scientific specialty, and particularly such men as Green, Williams, and Gysi. I would also add to that list, the Detroit Dental Manufacturing Company and the Dentists Supply Company of New York, as they have filled a very important place in the progress of prosthetic dentistry. We who are constructing dentures, owe a great deal to those men, as it is being made easier each year for dentists to become proficient in this work.

The subject under discussion is a broad one. I believe I can do no better than to emphasize a few important steps which the Doctor did not dwell upon and which he probably left for others to discuss.

A systematized technic which will give definite results should be the aim of all who construct dentures. The writer is thoroly convinced that a standardized technic of denture construction would be a great help to the dental profession, and as an evidence of his enthusiasm in that direction has had constructed motion pictures, depicting the various steps (which, by the way, were the first motion pictures constructed demonstrating

operative technic)—a technic which was the result of years of clinical study and of testing of the methods of other prosthodontists using what in his judgment was the most simple, practical and accurate technic for each step. This technic was fully demonstrated at the last National Dental meeting at New York by the prosthodontia section of the Detroit Dental Clinic Club.

The first step in this method of procedure (and one which the Doctor did not dwell upon) is to make Study Models of each case, as an aid to making a proper diagnosis of the requirements. This furnishes us with the opportunity of becoming familiar with the idiosyncrasies of the patient. (They all have one or more.) We can better estimate the difficulties to be overcome. It also demonstrates to the patient that you are giving the case careful consideration, and helps to establish the confidence of the patient that you are capable of giving sound advice when you explain to them what you propose to do and why you are going to do it a certain way. This is particularly helpful in those abnormal cases, where it is necessary to resort to surgical interference in order to make suitable foundation for the denture. This may mean the removal of abnormally placed teeth, reduction of connective and mucus tissue which has been caused by the unequal resorption of the alveolar ridge, or the removal of the portions of the alveolar ridge itself.

The "Study Models" can also be utilized for the purpose of making individual trays, which will require the minimum amount of material to make a correct impression. The individual trays can be made as an approximate impression over the Study Models with S. S. White Compound. Dr. Leberthals no-metal tray material, Dentists Supply Co. base-plate material or Detroit modeling compound, and numerous other materials; but with whatever material is used, the following steps are necessary if the denture is to be efficient.

First, the denture must be properly seated, with the strain on the hard and soft tissues equalized as nearly as possible when the stress of mastication is placed on the denture. Second, it must be the proper length in order that it will not interfere with the pharangeal muscles during the act of swallowing or coughing, nor must it be so short that it does not pass to the distal edge of the hard palate, thereby having adhesion broken when stress is placed on the anterior teeth. Third, the rim of the denture should be adopted as perfectly as possible to the labial and buccal aspect of the alveolar ridge and extend as far over the ridge as possible without interfering with or placing undue strain on the muscular attachments to macillae, in order to take full advantage of all the retention we can in a given case.

Dr. J. W. Greene was the first to classify these principles of impression making, and to originate a technic which would obtain these principles, and which could be proved by testing the impressions in the mouth.

The writer has for nine years practiced this technic and is absolutely convinced that it is the most accurate, scientific method yet devised. Further, that it is the most agreeable method from the patient's standpoint. Various teachers are teaching modifications of this method as their own, which are all based upon the original Greene technic, and honor should be given where due.

There is no reason, however, why every dentist should not be able to develop a technic that will enable him to obtain accurate results. It does not make any difference whether in the case of two or more operators the technic is the same in every minor detail, so long as it is sufficiently definite to be certain that they will arrive at the same accurate results.

Models.

Regarding this technic for making models as laid down by Dr. House, I

have no criticism to offer, as it will undoubtedly produce accurate results, in that you will have a very strong and practically unchangeable model.

The model technic used by the Prosthodontia Section of the Detroit Dental Clinic Club is as follows: Select from the Greene ready-made, non-changeable, approximate metal model, an upper metal model that will approximately fit the upper impression, and a lower metal model that will approximately fit the lower impression. A sufficient amount of plaster to cover the inside of each impression and the ridge of each metal model is now mixed, and placed in position, the upper metal model is gently pressed to position in the upper impression and the lower metal model pressed into the lower impression, and the excess of plaster which has been squeezed out around the edges wiped off. When the plaster has set, the impressions should be stripped off and the models trimmed, being careful to leave the shelf portion which clearly defines the edge of the impression.

You now have models which are about 95 per cent metal, with a thin film of plaster over them. No model can be made that is less changeable, and they will not warp or break and will stand a great deal of abuse. There is no possibility of squeezing them out of shape by careless packing, flasking or vulcanizing; any kind of a metal base-plate can be swaged over them perfectly in a rubber block swager.

We use Kerr's Snow White Plaster for vulcanite work, and Weinstein's Stone for aluminum, gold and platinum work. The writer would also suggest at this point that the only safe way to make a cast metal base-plate is to make two models for each case, cast the base-plate on one model, and then swage it over the other model to correct any warping or change in shape which may have taken place during crystallization of the metal.

I believe the technic for making trial or bite plates and taking the bite, as demonstrated in Dr. House's paper, to be the most accurate we know about. The writer has been using and demonstrating this identical technic of making trial plates for ten years.

The next point of difference is in transferring bite plates to antagonizer. We still use the Snow face bow. The Gysi Adaptable is generally conceded to be the most scientific, but I believe the Gysi Simplex, improved Snow or Hall antagonizers are all right from a practical standpoint, provided you use the mouth itself for the final adjustment of the teeth, for the reason that even the Gysi Adaptable Antagonizer does not make allowance for the difference in the relation of the dentures between the position when stress of mastication is applied upon them, owing to the resiliency in the soft tissues upon which the denture rests.

The face bow is an accurate method of getting the correct relation of the bite plates or occluding rims to the condyles of the mandible and transferring same to the antagonizer.

I would have been very much pleased to have heard a description of Dr. House's simplified technic for arranging teeth in the wax; I am sure it would have been very instructive.

When the occluding rims are properly contoured, the next step is to select the proper form and size of teeth to be used.

Regarding selection of teeth, I wish to quote a few lines from my discussion of Dr. Williams' work at the National Dental Association meeting four years ago; also a few of Dr. Williams' arguments, which I am firmly convinced are correct. I accept everything the Doctor has to offer in relation to his system of artificial teeth. It is a certain, definite and simple system, and truly revolutionary, as it eliminates guess work almost entirely, the teeth being the most perfect representations of natural teeth ever produced. The Doctor has referred to the mistakes of Nature, which may at least

be compromised in the selection of teeth of a different form from that of the natural teeth, in order to overcome the lack of harmony which previously existed. We should always bear this fact in mind, as frequently we may change the form of the dental arch and obtain a more harmonious result.

I have one criticism to make of the Trubyte teeth. It is my opinion that the Doctor, in his zeal to imitate Nature, has made the error that other designers of artificial teeth have made, viz., the bucco-lingual diameter of the lower molars is too great for the majority of cases. In a large percentage of cases the lower molars are lost long before the patient wears dentures. The tongue having nothing to confine it laterally becomes wider in this region, so that when molars as wide as bucco-lingually as the natural molars were are placed in a lower denture, there is not room for the tongue. This is a very serious fault in a lower denture. I know that we have always been taught that we should select broad molars so we may have more masticating surface. This I believe to be a fallacy, for the reason that a person has not as much power behind a denture as he would have with his natural teeth, and if the lower molars, say, a millimeter narrower than the natural molars, it would increase their efficiency. However, a little grinding and polishing will remedy this fault.

The temperamental or guess system was practiced because we had nothing better; so the best guesser turned out the best prosthetic restorations.

It is a mistake to believe that nature always produces teeth in harmony with face and features.

Those who believe in the temperamental theory always assume that when a man or woman of opposite temperaments marry, the children will be a blend of two temperaments. This may happen occasionally, but more frequently the children possess the most characteristic features of both parents. In other words, one child may inherit the general facial peculiarities of the father and the complexion, color of eyes, hair and teeth of the mother. In another child these conditions may be reversed.

Again, to follow the illogical arguments of the advocates of the temperamental theory, people of nervous temperament should be distinguished by greater intellectual achievements and brain power generally. But the fact remains, that all forms of faces and physical characteristics are included among the ablest and most intellectual people of the world.

We now know that the three typal forms of teeth exist in all races—that it is Nature's secret design in human teeth. So it is possible to beat her in her own work; for Nature, working more or less blindly, makes many mistakes, while we, working intelligently, can avoid these mistakes.

Therefore, it would be very unwise to adopt a system of artificial teeth on the assumption that all natural teeth are in harmony with the organism, or to conclude that in edentulous cases no improvement of the natural teeth which the patient had is ever possible.

The aim in designing artificial teeth should always be to maintain character in the tooth by keeping its typal or class features dominant.

The most uninteresting and unattractive tooth is one in which the characteristics of all three primary types have become so blended that it has no distinction. The problem of restoring efficiency in mastication with artificial teeth is an engineering problem, which has been greatly simplified by that greatest of all dental engineers—Professor Gysi—when he worked out with such definite precision the antagonizing surfaces of the Trubyte teeth.

In conclusion, I would say there is no reason why we should not endeavor to set the standard of Prosthetic Dentistry

so far above the position it has hitherto occupied as to make it impossible in the future for any self-respecting dentist to continue working in old haphazard guess-method ways.

The truest economy and the surest way to success is to throw away any method which produces an inferior article, the instant a better method is discovered. The writer believes fully that no one man can convince the dental profession that any technic is the one best way to construct dentures, as you will find as many methods of doing this work as there are experts in this audience. As a matter of fact, the differences are not great and are chiefly imaginary; but they serve to befuddle the issue of the standard technic. So the only way to settle this question is to get the experts of the country to organize themselves into a society to thrash it out and adopt as a standard technic that which the majority decides is the most simple, practical and accurate.

Dr. M. M. House (*Closing the discussion*): I am very sorry that the time of this Section is so limited, we hope to some time have it arranged so that we can have more time.

I have nothing to add more than to leave with you one thought, and that is that I feel this subject in dentistry the same as in literature, the broader vocabulary you have the better prepared you are for success. Give fair unbiased consideration and due trial in your own hands, to the various methods and improvements and your success will be in proportion to the knowledge you have of the work plus the earnest effort and care given each case.

I thank you for your attention.

Join the Red Cross

THE CARE OF FACE AND JAW INJURIES: LESSONS TO BE DERIVED FROM A PERUSAL OF THE LITERATURE OF THE PRESENT WAR.

By Major Robert H. Ivy, Medical Reserve Corps, Washington, D. C.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

IN THIS survey there is no intention of formulating any personal opinions. This would be unbecoming in one who as yet has had no actual service overseas. But, the writer having had wide access to the literature both in the English and foreign languages, it is hoped that a presentation of what appear to be some of the more important data on injuries of the face and jaws gathered from the reports of those actually doing the work, may be of assistance in preparing those of us who will shortly be caring for cases of this kind.

It was very early demonstrated in the present war, as it had been previously found in civil practice, that close cooperation between the surgeon and the dental surgeon was absolutely essential for the proper treatment of these cases. This treatment is divided into two principal parts, (a) care of the infected and injured tissues, and general condition of the patient; (b) special fixation required in fractures of the jaws, and special treatment of the oral and dental tissues.

The first of these belongs to the surgeon and the second to the dental surgeon. Men qualified to handle all phases of the case alone are rare. For these reasons the logical plan is the formation of a team consisting of a surgeon who is specially qualified to care for the tissues involved in face and jaw injuries, and a dental surgeon experienced in the splinting of jaw fractures and other special mouth problems.

Early Treatment.

In the early period of the present war, there appeared to be comparatively few men who understood the special problems connected with face and jaw injuries. Consequently, these men were put in special hospitals where the cases were concentrated. This arrangement had certain very definite advantages, but one unfortunate consequence was that instead of getting special care 24 or 36 hours after injury, the cases were often passed from one hospital to another, and might be several weeks old before they got into the hands of the men specially qualified to care for them. The literature is full of reports of cases of this kind. Thus Imbert and Réal (14) report three cases of serious gunshot fracture of the lower jaw which received no special treatment until 1 year, 3 months, and 2½ months after injury respectively. Recognition of the fact that the earlier these face wounds are repaired and the fractured jaws splinted the better, is seen in the later writings of workers abroad, and there are indications that an approach to the ideal is being attempted. The advantages of this early special treatment and plans for carrying it out are brought out by Frison and Brunet, of the French army (9). They

call attention to the bad effects of delaying treatment of face and jaw injuries until they reach hospital centers in the interior. Under these conditions the wounded arrive at the base with fractures that have been left to themselves for weeks, either united in bad position or suffering from non-union. It becomes necessary in these cases to undertake long and laborious treatment often with uncertain outcome as far as functional results are concerned. These writers therefore insist on the advantages of maxillo-facial centers in the zone of operations, where a surgeon specializing in the surgery of the face and neck will be associated with a dental prosthetist. Under their proposed plan of early special treatment, the fractures are easily reduced, permitting the placing in the mouth of a fixation appliance with the teeth in normal occlusion. This is the best preventive treatment of immediate or secondary hemorrhage, limits infection, and favors early union in good position.

Valadier and Whale (27) believe in the early closure of the soft tissues, if necessary before placing the jaws in position. To prevent shrinkage with cicatrization, rendering access to the displaced bone difficult, they advise that the normal contour be maintained by interdental appliances furnished with pads of dental modelling composition, to hold out the tissues. Nearly all writers agree that it is particularly essential that no loose fragments of bone be removed from the site of the fracture, as in many cases pieces of bone apparently hopelessly injured will recover their vitality and serve as a valuable matrix for repair.

Fractures.

In the treatment of fractured lower jaw with loss of substance, two schools of practice exist. The first, led by Imbert and Réal (15) and Colyer (6), considers that consolidation of the fracture should be assured by drawing together the ends of the bone even at the sacrifice of the normal occlusion of the teeth. They consider that it is more important to thus avoid unstable fibrous union and pseudarthrosis, necessitating later bone grafting, than to have an ideally shaped bone which is unable to bear the stress of mastication. They claim that the shrinkage of the jaw which results from this procedure is of minor importance, even where there has been a loss of continuity amounting to as much as 2½ or 3 cm. A second group, to which the majority of workers belong, believes that the reestablishment of the normal occlusion of the teeth of the two jaws is the primary consideration in treatment. Thus Bennett (6) finds that the cases in which it is desirable to sacrifice contour and occlusion in order to obtain union are comparatively few, and almost limited to a particular class. It may fairly be said that when normal position has been sacrificed to only a small extent, bony union could usually have been obtained without such sacrifice; and that where by such means bony union is obtained that would otherwise have been unobtainable, then the contraction is so great that the jaw is less useful than it would be with firm fibrous union in good position. The permissible exception is in cases of unilateral fracture of the region of the angle, when approximation of the fractured ends, by allowing the posterior fragment to swing forward, even where there is considerable loss of substance, often materially assists bony union and does not cause loss of occlusion of any moment. In fractures anterior to the first molar, this method of treatment involves a shortening of the alveolar arch on the affected side, and it is questionable how far the forward movement should be permitted. A careful perusal of later writings of Imbert and Réal (14) reveals the fact that these authors do not differ so very radically from the majority, in that what they advocate is rather a drawing forward of the smaller posterior fragments, and this

only when the fracture is situated behind the premolars, endeavoring at the same time to preserve the correct occlusion for the larger fragment. It would seem that their ideas on the question have been somewhat misinterpreted, leading others to go to undue extremes in this form of treatment, and thus subjecting the original advocates of the principle to unjust criticism.

Immobilization of fragments should be provided as early as possible in order to avoid fibrous union in false position requiring later corrective measures. Several forms of temporary splint have been devised, to be attached to the teeth by means of modelling composition. In this connection it may be permissible to call attention to a modified Gunning universal aluminum splint designed in the office of the Surgeon General for temporary early immobilization, of these cases, and described in the "Military Surgeon" for May, 1918. These splints are light and are packed easily into a small space, can be adapted to fit almost any mouth, and provide temporary fixation with the bite open, thus permitting room for swelling, breathing and nourishment.

Generally speaking, when the time comes for the application of permanent fixation, if reduction is resisted by newly formed scar tissue of callus, surgical division of the scar tissue or callus is advisable, to be followed by immediate fixation of the fragments in correct position. This is preferable in most cases to slow reduction by various complicated apparatus requiring weeks or months to bring about results that may be uncertain in the end (Herpin, 10).

The various forms of fixation apparatus employed in war fractures of the jaws are too numerous to mention here. It is notable that practically no reliance is placed on methods of external fixation except as adjuvant, by any of the writers. Direct fixation of the bones by plating or wiring is almost universally condemned.

Attention is particularly called to the work of Villain (28) in the management of what he calls "post-levator" fractures, i.e., those situated in the region of the condyloid process and the mandibular joint. The treatment of these cases is distinguished from that of other mandibular fractures by the fact, that the posterior fragment cannot be held by fixation apparatus. The usual methods of leaving the work of repair entirely to nature or by fixing the lower to the upper jaw are condemned by Villain. His methods have for their object not only the maintainance of the large fragment in normal occlusion but also the preservation of its fractured surface in contact or in correct relation to that of the small fragment. He uses a splint attached to the upper and lower posterior teeth, consisting of extensible rods to reduce the fracture and having a crank-like action permitting the normal movements of the jaw. This apparatus varies with the direction of the fracture and the loss of substance.

Another notable advance in handling severe cases with marked comminution and displacement of small fragments is reported by Kazanjian (17). These cases comprise extensive crushing of the anterior portion of the jaw with such displacement of the fragments that consolidation is problematical, altho the quantity of bony tissue saved may be theoretically sufficient to permit it.

The greater the injury, the more pronounced the displacement upward of the posterior parts and downward of the anterior fragments. In order for consolidation to occur in these cases, it is indispensable that all of the fragments be replaced in good position and held there. The loss of absence of teeth is a serious obstacle, for it is clear that the small bone fragments themselves cannot be of great help in this fixation.

From the standpoint of treatment

Kazanjian considers the cases as follows: 1. Cases in which the crushed portion corresponds to the incisors, canine and premolars; displacement downward. The molars can be used for fixation of the splinters. A German silver wire, in the form of an arch, is fitted to the teeth in such a way that the two posterior segments are solidly maintained in perfect occlusion. This arch follows the curve of the bone at the height of the middle of the teeth. Suture wires hold the bony fragments against this arch, re-establishing their normal points of contact.

2. Similar cases, with absence of teeth on one side.

Bands of metal are fitted to the existing teeth, prolonged as far as the premolar region of the opposite side. Suture wires suspend the fragments as in the first case. If the lack of teeth has done away with the normal occlusion, a vulcanite piece is made for the upper jaw which keeps the fragment down in correct position.

3. Cases in which the fracture reaches from one angle to the other, with extensive crushing, displacement and absence of teeth. An arch is fixed to the rami by means of silver wires, and the bony fragments suspended to this as in the preceding cases. The upper teeth may serve for sustaining the apparatus.

The suturing of the fragments is done as soon as possible after receipt of the wound, preferably within the first few days, the sutures being placed from within the mouth. Local anesthesia is preferred to general where possible. Absolute alignment of the fragments is not always possible, the essential thing is to obtain contact with reduction of the displacement. The suture wire should remain for three or four weeks.

Complications of Gunshot Wounds of the Face.

Secondary Hemorrhage. Valadier and Whale (27) out of 1010 cases of face and jaw injuries, found it necessary to tie an artery in its continuity thru a fresh incision in only 11. In severe bleeding their routine practice is to tie at once the external cartoid. Kazanjian and Burrows (18) do not favor this as it is attended with considerable difficulty and danger, and moreover does not always stop the bleeding. They state that profuse recurrent hemorrhage from the floor of the mouth nearly always comes from one or both lingual arteries or their branches. The procedure therefore in all copious hemorrhages from this area is to ligate one or both lingual arteries thru a neck incision, provided the anatomical conditions are compatible with a wound of these vessels. In 400 cases of gunshot wound of the face and jaws seen by Kazanjian and Burrows, 34 mild and serious hemorrhages occurred, of which 16 required operative ligation.

Pneumonia. Kazanjian (16) states that one-fifth of the patients with fractured jaws develop bronchitis or broncho-pneumonia, due to the septic condition of the mouth. Infections of the respiratory tract are often induced in these septic mouth cases by the use of general anesthesia in operations for concomitant wounds of other parts of the body. The mouth should always be cleaned and irrigated before giving a general anesthetic. The use of morphine should be restricted as much as possible, as it may paralyze the laryngeal reflex and facilitate aspiration of septic matter from the mouth. Patients should be kept in a sitting position as far as possible.

Mortality. In 1010 cases of face and jaw injuries observed by Valadier there were 27 deaths.

Trismus or constriction. According to Imbert and Réal (12), in four-fifths of the cases, trismus is characterized by the fact that it appears immediately after receipt of the wound, that it follows an insignificant lesion, and that opening of the mouth is easily brought about.

The lesion is probably a simple contracture or myotonia of the muscles of mastication. Treatment consists in spreading the jaws apart by a mouth opener with two divergent branches. This is introduced closed between the teeth and opened with a moderate sustained pressure. During the opening the patient is made to talk if possible, by asking him questions. Ordinarily the operation is not painful. By repeating the stretching daily, cure should be obtained in two or three weeks. Prinz, of Philadelphia, has suggested an ordinary clothes-pin as a stretcher for these cases, and a number of these are supplied in each army equipment.

Secondary Operations.

Bone Grafting may be indicated in old cases of non-union of gunshot fracture of the jaw. Aside from cases with great loss of substance, the bone-grafting operation should always have been preceded by a prolonged treatment by prosthetic fixation whose inefficacity should have been well demonstrated. The essential requirements, emphasized by practically every one, for successful grafting are as follows:

1. Operation should be performed only in the absence of any inflammatory or pathological condition in the region.
2. Communication of the mouth cavity with the wound must be avoided.
3. It is indispensable that as perfect immobilization as possible be assured by apparatus fixing the lower teeth to the upper.

The method and technic of bone grafting described are many and varied. Free tibial grafts are preferred by McWilliams (18), DuBouchet (7), Pont (21) and others. Direct free rib grafts are favored by Gallie and Robertson (10) and Platt (20), and indirect rib transplantation is described by Imbert and Réal (13). Cavalié (3) and Cole (5) prefer a pedicled graft taken from the jaw itself. Cole's method appears to mark a distinct advance in technic. As a pedicled graft he uses the detached lower portion of the jaw bone in the region of the symphysis. The extent of the gap is gauged by thoroly exposing the posterior fragment and the extremity of the anterior fragment. The basal portion of the anterior fragment, with the soft tissues still attached to it, is sawn off, and a pedicle consisting of platysma and deep fascia defined by lateral incisions. The graft is freed sufficiently to allow easy adaptation in its new position. The posterior fragment is freshened to provide as broad a surface of contact as possible and both fragments are drilled for the passage of a fine silver wire. The wires are passed thru the pedicle, surround the graft, and when tightened and twisted, insure snug contact between the graft and the freshened fragments. In this manner it is possible to detach a thick, well nourished bone fragment measuring 3½ cm. in length. Cole now employs free grafts only in cases where the gap is too wide to be bridged by a pedicled graft.

Recently, Imbert (11) has endeavored to throw light on many aspects of bone grafting that are still obscure. The principal points he takes up are the durability of the graft, the best method of fixation, what bones are most suitable for transplantation, and the question of stimulation of bone growth in the fractured ends by the graft. He found by numerous experiments and clinical observations that, while the transplanted bone was as a rule well tolerated by the tissues, yet there was never a union of the ends of the graft with the fractured extremities, and the transplanted bone nearly always had a tendency to undergo softening and absorption. On the other hand, the placing of a graft at the site of a non-union appeared to stimulate the latent osteogenic power present in the fractured ends of the bone, so that under favorable conditions of embedding the ends of the graft into the fractured extremities, a productive osteitis from the

fractured ends occurred which caused erosion of the graft, and by closely embracing the latter, maintained the fixation for an indefinite period. This hypothesis was based on an analogy familiar to dentists, viz., the changes that occur in tooth replantation. In the refixation of the tooth in the alveolus, the bony alveolar wall reacts by a productive osteitis which erodes the cementum and the dentins successively; this destruction occurs thru the penetration of bony prolongations which progressively take the place of the disappearing tooth tissue. These bony processes never unite with the tooth since they destroy it; only, because this process is of very long duration, the tooth fulfills its rôle during a period of time which averages several years. At the end of this variable period, the tooth falls out, and it is seen that the root is very much shortened, while the alveolus is filled up with bone. Since the consequences of putting in contact two bony surfaces, one of which has been previously deprived of all its vascular connections, are thus known, (because for the purposes of this argument, cementum may be regarded as bone), one is warranted, at least conditionally, in applying these facts to bone grafting proper. The fixity of the graft in successful cases is undeniable; on the other hand, one cannot imagine that there is a process comparable to that of true callus formation. It is then permissible to believe that the ends of the transplant are fixed by a mechanism analogous to that which immobilizes a replanted tooth. Working on this hypothesis, as in the case of the tooth, therapeutic success would only be temporary, since the end of the graft would be bound to disappear, eroded by the productive osteitis which its presence will have provoked in the fractured end. If this takes place, the graft ought to become mobile after an interval that cannot be definitely fixed, but which may cover several years. One must conclude from this that the final result of a bone grafting operation cannot be determined until after a very prolonged period of observation.

Imbert's other conclusions are: The best method of fixation of the graft appears to be by the thrusting of its ends trimmed to a point into the fractured extremities, and to dispense with all metallic means of fixation. The tibia is preferable to the rib as a bone from which to obtain the graft. The site of a pseudarthrosis often possesses a latent osteogenic power that can be aroused by almost any irritation, above all by the application of a bone graft.

Morestin (19) is the principal exponent of the use of cartilage transplants for the repair of defects of the jaws. He uses costal cartilage and claims many advantages for it over bone as a graft. He says that actual union, however, never occurs between the cartilaginous and bony tissue, but that the persistence of a slight obscure mobility does not cause noteworthy interference with the function of the jaw.

Sébileau (25) in discussing Morestin's methods, says that the objects of treatment in gunshot fractures of the lower jaw are (a) cosmetic, (b) functional, as exemplified in restoration of the correct occlusion of the teeth, and (c) restoration of continuity of the bone, conditions that will be appreciated by dentists especially. The cosmetic results of cartilage transplantation in Morestin's cases cannot be denied. As to the restoration of dental occlusion, Sébileau does not consider that this had been achieved in any that he has seen; nor is the continuity of the jaw bone reestablished sufficiently to permit the mastication of solid food. From the functional viewpoint therefore, he does not regard cartilage transplantation in these cases as a successful procedure.

Plastic Surgery of the Soft Tissues.

Most writers point out the value of immediate replacement after the injury of the lacerated tissues into their approximately correct positions, thus enormously facilitating later corrective measures. Secondary plastic operations should not be performed too early when infection is still present in the scar tissue. Other useful points to be remembered, according to Whale (27), are that pedicles of transplanted flaps can rarely be divided safely before three weeks, and that the margin allowed for shrinkage of flaps should be one-third the total area instead of one-sixth as usually taught. A new method of Thiersch grafting is described by Esser (8), viz., the epidermic inlay in combination with dental modelling composition. By this means the Thiersch graft is applied evenly and is maintained immovable under equal pressure for several days on the wound, and it is also possible to cover the under surface of a flap to be transplanted with epithelium. Cole (4) states that the soft tissues should not be closed early with neglect of maintaining the normal contour of the jaw bone by proper fixation, as this results in the patient's mouth being fixed in a closed position by the contracting scar. The primary suture of such wounds should never be undertaken when complicated by an associated fracture unless the fracture can be dealt with at the same time. In these cases a temporary open bite splint will be valuable in overcoming the tendency to contracture.

The important problem now confronting the men on the other side is not the best means of correcting these facial deformities; that has been pretty well worked out. The real question of the present day is how to treat the wounded early enough so that these secondary deformities may be largely prevented, thus benefiting the soldier and saving time and expense to the Government.

Anesthesia.

For all cases where possible, the general concensus of opinion favors local nerve blocking and infiltration anesthesia. The technic of regional anesthesia for these operations is described in the papers of Thoma (26) and Canuyt and Rozier (2). When general anesthesia is necessary, intratracheal insufflation of ether is of direct advantage. A modification of the Richardson intratracheal apparatus, to be operated by a foot bellows, all parts being of metal, to avoid breakage, has been designed by the Section of Plastic and Oral Surgery in the Surgeon General's office for use in Army work. This apparatus is described in the "Military Surgeon" for May, 1918.

Prosthetic Facial Reconstruction.

In spite of the most scrupulous early attention and secondary plastic repair, there are cases, not so numerous, however, as one would be led to believe from the publicity that they have received, of face injury with such extensive loss of features as to be beyond complete surgical restoration. In these cases the missing parts have been replaced by artificial masks and prosthesis made of different materials, some of which have proven satisfactory to a certain extent. The artificial restoration of features requires on the one hand great artistic ability and on the other mechanical ingenuity. The form of prosthesis that has attracted most attention is the painted electro-deposited copper mask devised by Derwent Wood, a distinguished British artist, and used by him in over 100 cases (29). Pont (22), (23), (24) has also devoted considerable attention to the subject and has adapted a plastic material for this purpose, which can be adjusted from time to time by the patient himself.

Fuller abstracts of many of the articles quoted in this brief surgery will be found in the February and March, 1918, numbers of the "Military Surgeon," and

also in the "International Abstract of Surgery" (Surgery, Gynecology and Obstetrics) for August, 1918.

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Discussion.

Major Joseph D. Eby, Atlanta, Ga.

There has been no opportunity to meet Dr. Ivy, a pleasure which I have anticipated and hope to realize soon. There has been no opportunity to read his paper and to formulate a discussion which would conform to his thoughts, and it is an exceedingly difficult proposition to discuss metamorphically or even to discuss accurately the treatment of war wounds of the face and jaws when you have never had any actual experience in the war zone.

In endeavoring to instruct our dental officers training camp at Atlanta, established March 15 by the Surgeon-General, we tried to classify that work largely in respect to the location of the dental surgeons in the field. Dental surgeons will accompany regiments; dental surgeons will operate in the hospital ambulance units and in the field hospitals. They will be stationed in the field of advance where the regiments will be, in the trenches or in the regimental dressing stations. Dental surgeons in the ambulance units will be in field hospitals directly back of the lines and the patients will be conveyed by motor ambulances and field ambulances. Those men are necessarily so very busy in attending to first-aid duties of the oral surgeon. We endeavor to impress on them the first-aid principles. The principles which Major Ivy illustrated we have also been teaching. We have been working on the plaster casts and showing by means of our surgical dressings the various ways plaster may be used as a dressing; how to apply it in the form of a four-tail bandage to act as a constrictor. We also teach all the principles of primary hemorrhage control, by grasping the bleeding points with forceps, packing and suturing. We endeavor to impress these things on the men to the very fullest degree. We also endeavor to impress on them the principles of

plastic (?) work during the same period.

In the evacuation hospital, which is well in advance, will be stationed dental surgeons, whose chief work will be to do what might be called intermediate work in respect to wounds of the face and jaws. The men will also receive first-aid service, will have diagnosis tags on their chest, and be conveyed by a line of ambulances to the hospitals. Their other work will be in control of immediate hemorrhage, which may have resulted from recovery from shock and increasing blood pressure. These patients will receive first-aid dressings or other means to stop the hemorrhages. So coupled with the treatment of shock and intermediate hemorrhage, these dental surgeons will also be called upon to assist the men in the hospitals during the period on the front.

Then we come back to the base hospital where the dental surgeons are located. Some are known as dental and oral surgeons. Others do the work of permanently mobilizing these wounds. To that end, we try to illustrate various lines of displacement and various lines of muscle pulls. We want our men to be as strong mechanically as possible. Certainly when it comes to doing mechanical work in the nature of intramedullary wiring or other means of splint work, all internal and external prosthetic work, that strictly belongs to the dental surgeon. There are certain surgeons who are only going to be called on to operate or assist, so the men who contemplate going into a base hospital should try to take up the work in the base hospital, such as wiring, splinting, immobilization, control of smaller fragments which are difficult to immobilize.

In the matter of splints, we must remember that there is quite a liberal laboratory equipment in the base hospitals. In front of that there is none. In spite of that we are out there to give first-aid to the greatest number of these men and I would think that a splint that would take two days to manufacture is not the one to be used. We must think of first getting the most easily obtainable material and a minimum amount of material. To this end, you will see that the British and the French are working up a nice splint. Any splint that can be made within three or four hours is the one to be used. We are working along that line and endeavoring to follow the principles brought out by Major Ivy.

In the base hospitals, naturally, the work of immobilization and attention to certain soft tissue conditions, carrying the man thru an infected period is what interests us. Col. Logan does not desire that we all be finished oral surgeons, rather that we cooperate with the general surgeons. He would rather have us know how to put on a surgical dressing properly. To that end, we are preparing direct models of the face and neck. The various types of wounds, small and large, are studied from the standpoint of surgical dressings. The study of surgical anatomy of the face, the care of shock, and re-insertion of surgical dressings are among the branches followed, conveying the idea that we are cooperating with the medical officer in that particular branch.

Another thing, gentlemen, I believe that is almost universally true, that from the standpoint of cooperation with the medical department it is a thing that must be settled more or less by the individual. If the dental officer goes to division headquarters and tells the division surgeon what he can do, or goes to the base hospital and impresses upon the men in the various departments that he has a definite work to do, I know they will give him attention. If we are not getting cooperation with the other departments, it is the fault of the individual.

In reconstruction work, bone grafting, skin grafting, plastic work, will be done in the general hospitals and in the recon-

struction hospitals in this country. In our efforts to teach at the dental schools we take up the manner and principles of bone grafting and skin grafting, not from the standpoint of doing it ourselves, but as assistants until we are qualified to do that work.

I feel that as a result of the work done in the three schools established by the Surgeon-General in Philadelphia, Chicago, and St. Louis, in which some 30 officers are assigned, that we are getting some of the timely work which Major Ivy spoke of and that this work is one of the greatest organization movements which Col. Logan and the Surgeon-General have inaugurated. In every one of the schools the medical officers left convinced that the dentists have a very, very definite obligation to fulfill. In the mechanical branch we had to do it all ourselves, but in the other work we could assist them. In the operating work we will have an entire country to draw on for materials and equipments and we must learn to go back and do the work immediately. Our work over there is to get the men out of the hospitals and to get them back to the organizations where they can work.

I feel sure that I am voicing the sentiments of the entire Dental Corps when I say that we are doing everything we can for the boys at the front. When we realize the wonderful things our profession is endeavoring to do along surgical lines, and when we realize the great obligation we owe to our boys who are wounded, we believe that we should keep the standards of dentistry way up in the air, and if we are able to do this and are brought home all right, then we will feel that our work has been sufficiently rewarded. (Applause).

George E. Meyer, Chicago.

I have just been informed that I have only five minutes in which to discuss this paper, so that it will be quite impossible to say very much in that time. However, in these few minutes, I would like to take up part of this time to compliment the Surgeon-General on the organization of this wonderful department of the Army and also to compliment him on his selection of the men that he has placed in charge, such men as Major Ivy, Major Blair, our good Col. Logan, and others.

Very few of you can realize the close relationship which this has brought us to the medical profession and will continue to do so thruout the world's history. It was also a great pleasure to me when I heard over here thru very good authority that at the present time we have almost 6,000 dentists in service. Very few of you realize that at the time of the arrival in France of Dr. Kazanjian, Major Valadier, and myself, we three and three others were the only dentists that I know of in the British Army for the million troops in France at that time. So you can easily realize the good we have accomplished within a year. I do not mean by that that there were only six dentists in the British Army in France. I mean there were only six commissioned dentists at that time, but there were dozens and dozens of dentists in the front lines fighting with the other men. The French, however, were working very hard at that time to get dentists, but I do not believe they got any commissioned dentists until December, which was almost one and a quarter years after the declaration of war. So that gives you an idea of the things that our good men have accomplished in this short time.

It was also a pleasure when I listened to Major Ivy's statement, that we are to have oral surgeons at the front lines or men capable of doing first-aid oral surgery. Very few of you can realize the importance of having some temporary splints, such a splint as was illustrated by Major Ivy, placed in the Casualty Clearing Stations. Our armies, as near as possible, splinted every possible fracture at the Casualty Clearing Station, or

known in our army as Evacuation Hospitals. Every case that came in there for transportation back to the base hospital, we minimized the pain and immobilized the parts as far as possible. But oral surgery cases very seldom received any attention until at least from one day to four or five months. Usually the cases that we received were at least four days old, depending upon the time it took to transport patients from the front line trench back to the base hospital. The reason of the importance is this: Supposing you have a man who is wounded and the anterior portion of the mandible is blown away, immediately thru the contraction of the muscles of the face those two lateral halves fall together. This brings out one point in my experience. I believe that the immediate establishment of normal occlusion is the proper treatment at the very beginning, instead of letting those two bones come together and form one. The importance of this is that when the patient comes back to the hospital with those two bones welded together, it is practically impossible to bring back those broken fragments to their normal occlusion. Then what happens? First, it took from one week to six weeks to clear up the infection, in our experience, and then work again by the mechanical oral surgeon to bring back into normal position these broken fragments which had been allowed to come together. It took from a month to six weeks to bring them back and in doing so we had stretched the tissues so much that it would be impossible to place a graft in position.

There is one more point that I wish to mention and I am thru. That is this: My experience in France and my observations are that the normal contour of the face is of far more importance than if mastication is impaired to some extent, for this reason. I had a young officer, a cousin of the Duchess of Westmoreland, and also two others, who went back to England on leave after being in the oral surgery hospital in France waiting for bone grafts. One of them had a very bad facial distortion. They were all very horrible sights to look at. They went home and came back with this story. "Don't let me go home again until you have finished me up." They said, "Our friends at home with legs amputated were going about, dining with friends and were taken everywhere, while we had to stay locked up. We could not meet any of our friends. We could not sit at the table." They told me of another man who could not go out in public or get a position, while a man with an amputated arm or limb could always get some sort of a position. Then is it not true that that is very important? Always remember the valuable work the dentists are doing in this war.

I thank you.

Charles H. Oakman, Detroit, Michigan.

There are just a few things I want to say in regard to fractures. I enjoyed very much Major Ivy's presentation of the methods of caring for fractures. The devices the doctor threw on the screen are quite unusual to most of us. One thing which is absolutely imperative is to have the mouth put in as hygienic condition as possible before the fracture is reduced. I noticed in the paper which Major Ivy read that the author did not believe in wiring the jaws. In some cases, wiring does very well and when done well it is preferable, in some cases, to intra-dental splints. I believe nearly all those cases can be handled under local or conductive anesthesia. As Major Ivy said, the patient should be placed in an upright position, which eliminates a great deal of trouble. When called upon late at night to reduce a fracture of the jaws, it is often well to apply a bandage, which will support the fragments until morning, when the patient can properly be cared for in the office with the aid of assistants. It is often a mistake to attempt to do perfect work

without the necessary equipment and assistants. Of course, much depends upon the nature of the fracture. A simple fracture can be attended to in a short time without much effort, but it is the more complicated fractures which I have reference to. It is my practice in reducing complicated fractures, in case wiring is done, not to allow the patient to sleep flat upon his back. The first two nights, it is my custom to insist that they sleep in somewhat of an upright position in a Morris chair or other suitable chair, the idea is that if the patient starts to cough or try to free his throat of mucous or blood, it would prevent him from the disagreeable effects of semi-strangulation. In the next place, the patient does not sleep as soundly as he might in bed and is able to recover from any sudden desire to open his mouth. After the second night, the patient is allowed to sleep in a bed with his head high. A few nights later, he may lie nearly in a horizontal position. This is precautionary, and in may cases, very effective. The head and jaws may be bandaged for a few days over which broad strips of adhesive plaster are brought under the jaws and over the head. While this has very little to do directly with keeping the jaws in apposition, it has a psychological effect on the patient, to some degree at least. He should also be cautioned, when the desire comes to cough, sneeze or expectorate, that he must be careful not to put any undue stress on the wires. The more intelligent the patient, the better result, as a rule, will be attained.

Major Robert H. Ivy, Milwaukee, Wis. (*closing*): I have nothing further to say except to thank those who discussed the paper, particularly Major Eby, for putting before you the general ideas that are being worked out in Washington for the protection of our troops, and Major Meyer for giving us the benefit of his own experience on the other side.

In regard to Dr. Oakman's discussion, I think the men spoke of placing the wires in the bones, but not in the teeth. They had wired the teeth over there in suitable cases, but they are condemning the placing of wires in the bone itself, as we have found over here to be very bad practice.

Notice—Tomorrow; today will be yesterday. Send your Relief Fund Christmas Fund check today

SYSTEM IN TEACHING PROSTHETIC DENTISTRY.

By Edwin H. Mauk, D. D. S., San Francisco.
Professor of Prosthetic Dentistry, University of California.

(Read before American Institute of Dental Teachers, Pittsburgh.)

THE title of this paper may suggest to some the attempt to apply to this highly technical branch of our art, the methods of the efficiency expert, or it may seem to smack of the widely advertised correspondence course of the common or magazine variety.

Neither of these, extremely useful as they are in their fields, have been the incentive to the writer hereof to unburden himself of the observations following.

However, both may have had their part in his subconscious mind in stimulating an effort toward an orderly arrangement and application of the diversified fragments of knowledge gradually acquired by accident or intention, thru years of association with the subject while endeavoring to impart some of its principles to others. Indeed, one cannot fail to be impressed by the lack of efficiency of the average student, and his fearful waste of the time at his disposal in purposeless and ineffectual movements, even tho he feels he is putting his best into his work, Seeing this waste of time, and with it energy, it may well be that in the near future we shall find it advisable to include somewhere in our curriculum a study of co-ordinated motions correlated with brain reflexes. This might appropriately come in our new course, Applied Physics.

Already we see an application of these principles in the work of the Gilbreths, and others, in the teaching of partly disabled soldiers to take up new and wholly unfamiliar vocations, oral hygiene among them. In many instances entirely new series of brain reflexes are established as well as the physical motions necessary in the performance of the work.

But before we apply any system to teaching, we must know exactly what we want to teach, and settle definitely whether the thing we are going to teach is useful knowledge. It may prove to be merely so much mental junk, which, unlike that which accumulates in the garrets and basements of our homes, unfortunately is not so conveniently dragged out and disposed of, but remains to clutter the mind, perhaps to impart its own mildew to new accumulations of really useful facts. Right here is need for fine discrimination, lest in our ardor for the immediate practical application of all our teaching material, we may omit that which has its correlative value in giving more than one aspect of a problem.

For instance, a student may be so trained technically as to be able to execute a beautiful bridge, without any conception of the pathology of degenerate apical areas and traumatized gingivae, or the significance of faulty articulation. He might be termed a dental jeweler, but not a prosthesist.

On the other hand it is obvious that to produce a technically skillful prosthesist, it is neither necessary nor desirable to require the student to make technic specimens of obsolete replacements, nor

to use processes that were abandoned for something better about the time he was going from knickers into trousers. One of our instructors at one time insisted that the students learn to do all of their soldering with a mouth blowpipe. He was a jeweler, by the way, before he took up dentistry.

How then shall we define the boundaries of our teaching subjects?

First:—By careful selection of the subject matter for its practical value in present day dentistry:

Second:—By elimination of obsolete ideas and superfluous details, also duplicate methods in laboratory procedure. On what remains, the teaching effort should be concentrated.

To offset the possible narrowing effect of this vigorous pruning, reference may be made in didactic teaching to dental history sufficient to furnish a background to the student, against which will stand out in his mind a concept of that which is Dental Prosthesis today compared to that which was "Mechanical Work" yesterday. In addition, comparisons should be made of other methods and processes in vogue, with reference to their merits and demerits, to enable the student to judge of the soundness of the teaching he is receiving, and allow him to feel that his horizon is not fixed by the traditions of his school, nor the personal prejudices of his teachers.

Third:—Evolution of new methods. In this as in other lines of human endeavor, the aid of research must be invoked, in order to place dental prosthesis on a foundation of scientific facts.

Research is synonymous of experiment, thru it empiricism becomes science.

The dentist must cease guessing, for instance, that four teeth will do their own work and that of ten other teeth besides in a bridge from molar to molar. He must *know* that those teeth will prove unequal to the task just as he will himself fail if he tries to do three men's work every day. He must cease hoping that by some miracle or special dispensation in his favor, such a formula as: "A bowlful of plaster, a dozen or so of porcelain teeth, two sheets of rubber, a cup of water, mix, add salt to taste, and cook in a moderately hot vulcanizer" will produce an efficient masticating apparatus, one that will "bite corn off the cob" or "take a chaw off a plug o' terbacker."

He must *know* the limitations within which he can obtain beneficial results, and *know* how to take advantage of every favorable condition both in the field of his operations and also in the materials and appliances with which he must work.

We must recognize the fact, that in a broad sense, all of dentistry, except such subjects as dental pathology and therapeutics, prophylaxis, and oral surgery, is prosthesis, inasmuch as it restores a lost part.

If we consider a single tooth a "part" in the sense that it is a human organ, then, of course, the restoration of even a portion of such an organ lost by disease (caries in this instance) is replacement; i. e., prosthesis. That branch of dentistry, however, which is concerned with tooth cavities has been arbitrarily termed operative dentistry, in distinction to prosthetic dentistry, the art of restoring the lost tooth or teeth as entire units.

In Dr. G .V. Black's writing, grouped under the heading Operative Dentistry, we have a complete system which the dentist may follow with the assurance that it will meet his every need along this line:—that its methods are proven, and scientifically sound, and that there are no gaps in the detail of the physical actions and movements necessary to accomplish the desired end, i. e., successful filling operations.

When we turn, however, to so-called prosthetic dentistry, what do we find?

"Systems," for this, that or the other, impression, or plate, or crown, or bridge we have a plenty, named

after their originators, plagiarists or most vociferous itinerant teachers, but no complete, detailed summing up of scientific facts. No system exists which within itself suffices to accomplish the replacement of one tooth or all the teeth, as the case demands, with due regard to the prevention of further loss, utilization of favorable anatomical and physical conditions present, and the correlation of small partial restorations with complete restorations of the entire denture.

Such a system there must ultimately be, if dental prosthesis is to be conducted with the same orderly sequence of details as Black's work has made it possible to apply to filling operations. It must be said that recent text books present evidence of a long step in this direction, and in this thought of an ultimate system we must of course, recognize that every man who has worked out a so-called "Technic" of any phase of prosthesis, has contributed a part toward such a system. Any "Technic" is the expression of an effort toward system, and may be complete in itself, without bearing any relation to the next problem encountered in the restoration of the same denture.

Dr. Black, no doubt found such conditions; indeed we are led to think that it was largely this very diversity of methods which prompted him to test conflicting ideas, reject the impractical, utilize the logical and sound things, and even to develop new methods in the instances where those already in use did not measure up to his standards.

Probably the chief obstacle in the development and establishment of such a system is the great variety of technical and artistic processes embraced in its field. Dental prosthesis draws so largely from the arts and crafts that he who would weld all its diversified elements into one universal text must be versatile indeed, scientifically trained, and yet endowed with an intensely practical mind. All these qualifications he must possess if he is to produce such a text as dentists and dental teachers can and will accept in the course of time as authoritative and sufficient, just as they are accepting Black's work because of its unassailable truth, and well tested processes, once they have comprehended it and mastered its principles.

While awaiting the advent in prosthesis of a Black to do for it what he has done for operative dentistry, we can at least by concerted effort contribute largely to that desirable final object. Thru classifying and segregating the knowledge already extant, eliminating, improving where necessary, evolving new processes where nothing seems to quite fit the needs, we who have to do with teaching can make this knowledge more available, more widely diffused.

What constitutes prosthetic dentistry in Illinois? In Massachusetts? In New York? In California? In Texas? In Ontario? What relation exists in the teaching of the Art in these various sections? How can a student be assured in one place of getting an approximate total of what is taught in the others?

It would seem that only by closer coordination of curricula can any such right be assured to the student even in a moderate degree. While this paper was being written, no less than five different candidates, for our State Board of Examinations, graduates from as many different schools, came to the writer for information on the technic of making a "Standard" crown. This may be more widely known as a "Plate and Post" crown and the name Standard may indicate the insularity of our schools and our State Board. The point is that the graduate from the school which has the best reputation of the lot (no better school exists, in my estimation,) said that he had never made such a crown and had never heard of it, but that he had specialized

on the making of dowel crowns with a band. (The Richmond type.)

In dealing with this situation a real live commission composed of representative teachers from various sections of the country could accomplish great headway, provided each of its members would do his share, instead of letting the other members do it, and providing his school were not so hampered by personal prejudices or by its economic conditions that it could or would not accept the findings of the commission.

This may be "old stuff," but if it is, what are you going to do about it? Simply because it has been tried and has brought no results, are you going to sit still and let well enough alone, or do you refuse to admit that what is good teaching in the East and West ought to be good teaching in the North and South also?

An eminent economist recently observed that the great problem of this age is distribution. Distribution of natural resources, agricultural products, of manufactured articles and of knowledge. Distribution of knowledge assuredly involves didactic teaching, tho such teaching is by no means the only or best channel for diffusion of knowledge. Visual instruction, manual training, and the plentiful use of teaching models, must all play their parts in teaching our highly specialized subdivision of human knowledge.

A system which will stand the acid test of teaching dental students will in most details stand the test of use by practitioners, unless the teacher be too much of a pedagogue and too little of a dentist. As a modest contribution to such a system, may the writer be permitted to present somewhat in detail a description of some of the concrete results of his work along this line.

My conception of the teaching plan of some of the early English Universities is that the students were left to their own responsibilities to a great extent, associated with their tutors rather intimately in dormitories and outdoor life, and held to certain requirements in recitations and essays, being expected to gain the necessary knowledge from their books or tutors in their own way. This was the condition existing to a great extent in many of our dental schools up to the last decade or so, the student being required to do certain prescribed things and allowed to get this work done as best he might. In the meantime he was referred to certain text books and listened to lectures of various kinds presumed to aid him on his struggling way.

The largest net result of this system being that he often got more from advanced students and outside dentists than from his school, the school's chief function thereby became one of supplying the environment for study of a kind, and furnishing the final authority for him to pass from a condition of paying for the opportunity to practice on patients to one under which they began to pay him for practicing upon them. Hence the term "Dental Practice."

Several years ago the writer arrived at the conclusion, quite advanced it seemed to him at the time, that we ought to have rigid requirements for the student and then assist him by every legitimate means to meet those requirements, so that the teaching might come from the top instead of from the bottom.

On this assumption we began to build. It was felt that to assure technical skill, laboratory technic, popularly despised under the term "Dummy Work" was needed in large doses. But we determined that we should concentrate on one good method of doing each thing, not make the victims do a piece of work by a perfectly good procedure, and then do it over again, merely for the sake of the training involved, by means of another procedure which might be bristling with difficulties no sane dentist would undertake to overcome.

The selection of technic work was

likewise made under the primary consideration of its relation to practical work upon patients, to be taken up later in the course, and also to be administered in large doses.

Didactic work consisting of lectures, recitations on prescribed portions of texts, and quizzes of general character was also arranged so that the lectures would either slightly precede the work in hand or proceed with it, not taking up crowns for instance while students were making casts and vulcanite work or vice versa.

Another pressing need had to be met: Students find it difficult to form a conception of prosthetic structures without tangible example of the things they have to make. So the production was begun of a series of teaching specimens or models showing progressive steps in construction, actual size.

Nowadays in our school, when a student is required to make a piece of technic work, the corresponding teaching model is displayed in the laboratory during the time allowed for the piece, usually one month. At the time assigned for beginning the work, the class is assembled in a room which we call the Prosthetic Clinic laboratory, which is fitted with a dental chair, engine, laboratory bench, polishing lathe, draw press and rolls, casting appliances, vulcanizer, in fact practically everything pertaining to prosthetic work as it would be carried on in a regular office. Portable seats, circus style, arranged in tiers, in the shape of a V are provided for the students, with the demonstrator between the extremities of the V.

At this time each member of the class received a mimeographed sheet of instructions covering the technic and the Instructor or Professor devotes the hour to explaining this, in detail, together with clinics interspersed with "Chalk Talk." Next, each student receives a laboratory technic card, indicating definite steps in the technic in their proper order, each of which he is required to have checked by the instructor before proceeding to the next. This prevents mistakes to a great extent, and when mistakes are made permits them to be corrected without reconstructing the entire piece.

During this period, the lectures and quizzes proceed. Co-ordinated as nearly as possible with the nature of the technic pieces under construction, they are also arranged to comprise the general subject of which the technic piece is an example. For instance, while a partial vulcanite plate and repair is being made, the lecturer takes up rubber, vulcanite, vulcanizing, vulcanizer, presses, flasks, packing and finishing, etc.

These technic procedures are designed with the thought of eliminating all superfluous details which do not have a direct relationship to the making of an identical piece for a practical case. Alloys, karats and gauges of materials, styles of teeth and facings required are all indicated, for both technic and practical cases, in either the legend of the teaching model, the laboratory card, the instruction sheet, or all three. For construction of practical cases in the infirmary which are assigned as nearly as possible in progression with the technic work, the student is referred again to his technic sheets and cards, besides the instruction received at the chair by the demonstrator. The variations and additions involved in practical work, as distinguished from technic, are specifically covered in the lectures, during which appropriate portions of the text are assigned for study also. For instance, during the making of dowel and shell crowns, the infirmary procedure of root and stump preparation is given.

In addition to the above details, we are also considering the inclusion with the technic instruction sheet of a list of instruments needed in the procedure and the sequence of their use. It is also intended to apply the laboratory card, with the checking of successive steps, to the practical cases as soon as the details

can be worked out, and for each fixed or removable bridge or partial plate to require a study model of the case as well as the working model and another showing the conditions when completed. Not only will this have its value as a record of the student's work, but what is far more important, will furnish a large variety of examples of different design for similar conditions.

Having such a plan as here outlined and adhering to it strictly carries a big advantage to the teaching staff by eliminating conflicting ideas. Any member of the staff who is concerned with teaching prosthetic dentistry can give the student instruction at any stage of the work. He need not fear that the next instructor who comes in contact with the student will reverse his directions. Any differences of opinion are thrashed out with the Head of the Department, who welcomes suggestions for betterment.

The student also profits by this arrangement—he may go on with his work knowing that if one step is approved by an instructor he will not have to tear it all to pieces and begin over again the next day to please another instructor.

The teaching models are the standard for comparison, and of course, changes will have to be made in them from time to time as new methods develop.

One required piece, specified in each session, is made by the student on his own judgment. No instruction sheet nor laboratory card is issued for this, but we encourage the student to consult with us and his fellows as to details. We call this a museum specimen, meaning that it may get into the museum—perhaps—if it is extremely good.

For the freshmen and juniors this consists of the same thing for the entire class.

In the senior class we specify several pieces, so that groups of four or five only will be working on the one thing.

The Seniors draw lots for these, relieving us of any charge of favoritism in placing the best selections, and making quite an occasion of gayety.

All technic work is displayed in a large case in a room open to the students at all times. This spurs them to produce work of which they will not be ashamed, knowing that it cannot escape criticism. All technic work is returned to the students at graduation, or upon leaving the school for any cause with the exception of a few museum specimens selected from year to year for their excellence, this of course being an honor much sought.

The graduates find these specimens of much assistance to them in their offices in explaining the nature of various kinds of prosthetic work to patients. The expense of making technic work is more cheerfully borne when the student knows the specimens are to be returned.

In order to make sure that the student at the end of his college course, picks up the loose ends of instruction and acquires a comprehensive grasp of the subject of dental prosthesis, we have instituted the following plan: In the second semester of the Senior year, a number of subjects are assigned for a thesis in lieu of a final examination. This year we have ten topics which pretty thoroly cover the subject. About ten weeks are allowed for preparation, including the Christmas vacation of three weeks. The theses are all presented on the same day. The best one of each group is selected, the writer is required to read it in class, and several other members of the class appointed to discuss it. Thus every student has to write a thesis, discuss another thesis and listen to the reading and discussion of all the others and his final credit is based on his discussion as well as on his own thesis. Two theses are usually presented at one session of the class, the reading and discussion of these taking from two to four hours. Much interest is aroused, the discussions are highly entertaining and instructive and sometimes amusing and it would be a dull student indeed who

did not derive more permanent and lasting benefit from this plan than he possibly could from a written examination. (I will not inject further details here, but will furnish them to any one interested).

SUMMARY.

System is needed in teaching prosthetic dentistry.

The system must be carefully thought out. Superfluous details and obsolete methods must be eliminated.

Select teaching material for its practical value.

Condense it but include enough history and comparison of existing methods to avoid making the student narrow.

Concentrate on teaching one good method for each phase of prosthesis. Duplicates waste time and scatter energy.

Don't ask the student to do something you can't do.

Stop guessing—be sure your technic will produce the result you claim for it.

Co-operation between various schools is lacking.

Co-ordination of curricula is needed to assure the student he is getting good teaching, no matter in what section of the country.

Invoke the aid of research. Make empiricism science.

Utilize didactic teaching, visual instruction, manual training, teaching model, all leading to practical cases.

More knowledge wanted and better distribution of what we have.

THE AUGMENTATION OF THE TWO FUNDS OF THE NATIONAL DENTAL ASSOCIATION.

By Otto E. Inglis, D. D. S., Philadelphia, Pa.

A THOUGHT applicable to my theme was expressed many years ago by Mr. Barney Barnats, of England and South Africa.

Owing to the passage of time, I can only give the quotation from long distance memory: "There are men who think in thousands and only the ten cent pieces come their way, while those who think in millions get millions."

With this preamble, let me state that the object of this paper is to offer a suggestion as to ways and means of raising a large sum for the use of the Relief Committee of the National Dental Association. The latter committee reports $28,312.69 in bank after six years addition to a nucleus, given by California members presumably collected to relieve those suffering from the San Francisco earthquake and fire. ($50,000 is aimed at.)

The Research Commission in The Journal of the National Dental Association for January, 1917, page 103, reports a present ambition of an endowment of one million dollars with $380,000 in sight.

Thus approximately is Mr. Barnat's aphorism vindicated by the face of these showings.

The Research Fund seems in a fair way to be realized yet it would do no harm if it were largely and immediately increased.

That the Relief Fund, as it at present exists, is far below requirements, an actual example will show.

Before me is "The Weekly Roster" official bulletin of the Medical Organization of Philadelphia and vicinity.

The Committee on Benevolence of the Philadelphia County Medical Society prints a report that shows nine persons receiving annuities (not exceeding $200.00 to each) and three persons

temporary relief and says, "Yet the time has come when we are able to use up our entire income in taking care of the few annuitants and beneficiaries referred to."

Attention is called to the fact that the Philadelphia County Medical Society is meeting expenses aggregating nearly the interest on $50,000 in paying out the benefits mentioned to nine persons.

As this is the sum set by the National Relief Fund and only two-fifths realized, the capacity of the Committee to give anything but most meagre benefits is manifest.

What shall we do about it? The proposition is, that we stop thinking in thousands and begin to think in millions and perhaps they may come to us. Can it be done? It can, and by a plan so simple that all that it involves is the wish and will to raise the money, and the application of our mutual friend and entertainer, Hashimura Togo's, homely philosophy, "By not eating something, you can save it."

First, however, why should we raise the money? Because, if we do not, we obviously can not give to temporarily or permanently disabled dentists that measure of relief which all large associations should supply to needy brethren and in default of which they must of necessity fall into disaster not to mention their dependents.

Therefore, by its very existence the Fund justifies its ends.

The Research Fund requires augmentation for the reason that knowledge is our great need and the problems of the day and the future must be solved by those whose psychology and training fit them for the conduction of investigations leading to such solutions.

It is just that those who receive this knowledge for practical application in practice without other effort on their part, should pay not only the cost of such investigations, but also a just return for the time and skill of the investigators so that they shall be freed of personal incubus and this with all due deference to their pride and generosity and even egotism. By this reference is made to those who conduct costly programs, investigations and not those who do valuable work as a moderate sacrifice of time and self; for such is only a just return for benefits received.

It may fairly be estimated that the 5000 members of the National Dental Association in attendance at the New York Convention in 1917 paid $50.00 each in expenses, a total of $250,000 and lost $75.00 each in revenue from their practices, another total of $375,000, altogether, $625,000.

Can we have the cake and the penny too?

Yes, if we have the wish and the will.

Respectfully the following plan is submitted:

Instead of holding our annual conventions at some central point, let us hold a silent convention in our offices and pay the proceeds of such time and usual expenses into the treasuries of the Research Fund and Relief Fund and thus at once establish ourselves forever.

In brief the following suggestions are made subject of course to modification.

Let all local societies meet as usual and appoint a committee of judges, who shall select from the papers or Clinics, of say, six months or the year, the best, or best two, and send it or in case of clinics, a description to the Research Committee appointed by the State Society. This committee shall send the most valuable papers and clinics to the Research Committee of the National Dental Association, which shall appoint a committee of judges to pass upon the fitness of such papers for publication in The Journal, which may be enlarged for the period designated to accommodate any increase of valuable material. Such papers or clinics as are of great value shall, if necessary, be referred to the

authors for amplications by illustrations, models, etc., at the expense of the National Dental Association. Meanwhile, the research work of the workers for the Research Committee shall go on and, when ready, be published.

By this means we shall lose nothing that may be of value in a Convention but the spoken word and the social features. The writer does not underestimate the value of these nor of the vacation taken and in no way suggests the abolition of our usual conventions beyond the once or if need require it and the feature prove of value an occasioned repetition for the accomplishment of a definite object.

This measure should produce about two million dollars, of which about $1,500,000 should go to the Relief Fund.

The suggestion is made that $250,000 be set aside as a fund for the foundation of a dental insurance Society against disability and death. In brief, it is suggested that members subscribing shall pay into this separate fund an annual amount for a definite term of years while in health, all based upon the experience and judgment of actuaries of insurance companies handling this class of business. In case of disability, the subscriber shall have the right in all pride of payment, therefore, and upon due proof as now customary of claiming residence in an apartment, hotel, cottage, colony or farm colony, as shall be advisable, for himself, wife and children of non-self-supporting age; or in case of his death, his wife and children, or the guardian of the latter, may claim it. In case such a step may be necessary, a payment into the endowment fund by the applicant of possessions up to a certain amount *if owned* as now demanded by the Masonic order might be advisable. All such matters could be settled by actuaries.

It is understood that this hotel, etc., shall be located in one place in the United States and aside from the original endowment of $250,000 be self-supporting.

With the balance of the Relief Fund the care of non-subscribers either temporarily or permanently can be conducted in such ways as the trustees may elect.

The Research Committee is now obtaining pledges of support and it could easily be ascertained if convention attendants would be willing to submit to this arrangement; we can thus obtain knowledge, care for disabled brethren, and make respectable provision for disability or old age.

Is it not worth while to do something of respectable magnitude?

Relief Fund Christmas Stamps
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The Research Department

CONDUCTED BY
THE RESEARCH INSTITUTE OF
THE NATIONAL DENTAL ASSOCIATION
CLEVELAND, OHIO

WESTON A. PRICE, M.S., D.D.S.,
President

REPORT OF LABORATORY INVESTIGATIONS ON THE PHYSICAL PROPERTIES OF ROOT FILLING MATERIALS AND THE EFFICIENCY OF ROOT FILLINGS FOR BLOCKING INFECTION FROM STERILE TOOTH STRUCTURES.

By Weston A. Price, M.S., D.D.S.

(*Read before the National Dental Association, Chicago, August, 1918.)

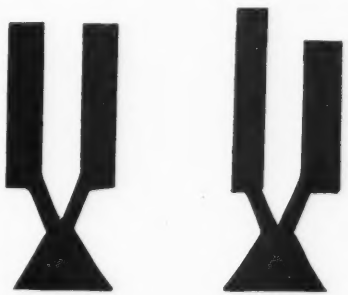
ROOT fillings are castings made within the pulp chambers of teeth. They must conform so exactly to the size and shape of that chamber that neither micro-organisms nor fluids, which may be external to the tooth, can enter or find lodgment. The form of this chamber is complex, uncertain and indeterminate and may vary thru a very wide range, which fact makes it necessary that the root filling material, or a sufficient part of it, be inserted in a moldable and plastic state. The physical properties of the materials used for this purpose are such as to make the task extremely difficult, even under ideal conditions of pulp chamber and readiness of access. The degree of exactness required is so great that few plastics can fulfill the requirements, since they do not have the same dimensions after taking a condition of set that they have in a moldable state. The problem is rendered still more difficult by the fact that the operator must work in a restricted field, often of very difficult approach and requiring slender, hair-like instruments to be used in curved or tortuous channels, even having islands and bays, and often many estuaries, all of unknown form.

That "a new truth is a new sense" has been abundantly demonstrated in our profession by the changes in methods

*The part of this report which refers to tests of root fillings made in sterile teeth comprises work done in the Research Institute of the N. D. A. by Dr. Milton J. Damlos under the writer's personal guidance, and the balance was conducted elsewhere.

of practice that have followed the demonstration of the effects of oral focal infections on the general health of individuals. A similar change is in progress regarding methods of root sterilization and an equally marked change of methods must follow the establishment of the truth in the minds of the members of the dental profession that the physical properties of the root filling materials which are in general use today are such that exceeding great skill and effort and favorable conditions are necessary to make a casting within the pulp chamber which has the fundamental qualities required of a root filling. We must acquire a root filling sense.

The materials that have been in most general use for root fillings are based upon adaptations of gutta-percha, the variations being chiefly in the solvents used to render it plastic or semi-plastic. We have not found in the literature, dental or otherwise, data on the involved physical properties of gutta-percha and the preparations of it as used in dentistry and it has been necessary for us to work these out in detail. We have had this work in progress for several years and have been fortunate in being able to engage the assistance of Dr. Dayton C. Miller, Professor of Physics, Case School of Applied Science, Cleveland, a physicist of international reputation. Gutta-percha is a gum and behaves similarly to the various waxes and gums. We have demonstrated, in previous reports on the physical properties of waxes,[1] [2] that the waxes and gums are likely to retain locked elasticity in the form in which we handle them; that, if two pieces of wax cut to the same dimensions have their elasticity released, they may change in relative length eighteen per cent, depending upon the direction in which the wax was in a condition of stress at the time it was chilled. This is illustrated in Figure 1 in which A represents two pieces of inlay wax which are identical in length and cross section. After they are warmed one has elongated and the other shortened, as shown in B. These are photographs from the actual specimens. The details will be found in the article referred to. We suspected that gutta-percha had corresponding physical properties and one of our first



A B

Two similar wax bars placed in a warm investment and cast. A, Before heating. B, After heating.

Figure 1.

undertakings was to establish the extent to which gutta-percha retains a locked elasticity. One piece of gutta-percha 70x70 mm, on being heated slowly, changed its dimension to 55x76.5 mm. On being raised to the temperature of boiling water the total area contracted 14.7%. The details will be found later in the more technical part of this report by Professor Miller. There was a progressive change in dimension beginning at about 40°C (104°F) and continuing to a temperature of 76°C (169°F). The length of the sheet decreased twenty-one per cent and the width increased twenty-nine per cent. In the second experiment, with another sample of base plate gutta-percha, the area and volume were determined and it was found that, when

[1]Price, The Laws Determining the Behavior of Gold in Fusing and Casting.—Dental Cosmos, March, 1911.

[2]Price, Special Researches in Physics.—Journal of the National Dental Association, October, 1914, page 110 (Vol. 1, No. 4).

starting with a piece 70x70 mm, the length decreased to 63 mm and the breadth increased to 72.5 mm; the thickness increased from 0.843 to 0.912; the area decreased from 4900 sq. mm to 4567 sq. mm; the volume increased from 4131 cm to 4165 cm. The intervening dimensions are given later in the report. With this piece the length diminished ten per cent and the breadth increased three per cent. The linear expansion, due to heat, of a piece of heated gutta-percha from which the elasticity had been released was determined and it was found to change from 121.502 mm to 121.797 mm, on being increased in temperature from 23°C (73°F) to 76°C (169°F). But a very important condition is disclosed by comparing the dimension at various temperatures on cooling with the dimension at the same temperature when rising. There is a lag which indicates a different dimension for a given temperature in the cooling process and it probably takes a considerable period of time for this lag to entirely disappear. This corresponds with the hysteresis in a magnetic field. This is graphically shown in the curve in Figure 8 Table 3, of linear expansions which gives the detailed dimensions in the rising and falling temperatures. An additional observation made to determine the change in volume showed that from room temperature to the temperature of boiling water the pink gutta-percha increased in volume 2.4%. A piece of drab gutta-percha treated in the same way increased in volume 2.2%.

The above determinations explain why fluids and infection always enter cavities around gutta-percha fillings, for every gutta-percha filling is from one to two per cent smaller after it has taken the body temperature and its final molecular state then at the time it was molded in the cavity. If we will think of a cavity with a dimension of 5 mm and a volume contraction of 1½%, which would occur if the gutta-percha were heated to about 75°C at the time of insertion, the crevice formed by the contraction would be sufficient to permit twenty-five bacteria, each having a diameter of one one-thousandth of a millimeter to enter abreast, and smaller and larger ones in proportion. Linear contraction is one-third volume contraction. For this reason even temporary gutta-percha fillings, if they are to protect dentin from irritation and infection, should always be inserted in cement. We have made determinations of the dimension change when heat is used as a means of making gutta-percha plastic, as follows: Glass cylinders were packed with gutta-percha, made plastic by heat and the gutta-percha submitted to high pressure while cooling. After cooling ink was applied and it readily entered beside the gutta-percha which it could not do while it was hot. Figure 2 is a photograph taken thru the glass tube, which has a diameter of about 5 mm. We cannot maintain pressure on the gutta-percha while cooling in a cavity as was done here and, notwithstanding this maintained pressure which kept the gutta-percha flowing as long as its resistance was less than the maintained pressure, the contraction was sufficient to let the ink penetrate freely around the gutta-percha as shown. The pressure used was approximately the limit of the glass tube and equalled several hundred pounds per square inch. These studies have been primarily to determine the actual and relative efficiency of root fillings made of gutta-percha. We have not included the cements in this series but expect to later. Dr. A. E. Webster, Toronto,[3] has studied the efficiency of cements and chloro-percha and gutta-percha and found them all defective. He did a splendid piece of work which has not had proper attention paid to it. The rendering of gutta-percha plastic by means of heat is not

[3]Webster, Temporary and Permanent Fillings as Barriers to Bacteria.—Dental Review, April, 1903.

at all adequate as a means for molding it to pulp chambers, and the required plasticity is usually secured by means of solvents. For this purpose chloroform and oil of eucalyptol are chiefly used. Also chloroform in connection with rosin. Studies have been made to determine the physical properties of these solvents and of the combinations of

Figure 2.

gutta-percha with them. Chloro-percha has been used for many years as the plastic form of gutta-percha and the excess of shrinkage has been presumably controlled by the addition of cones of gutta-percha placed in the liquid. Altho exact observations had not, to our knowledge, been made, this material has been considered inefficient by many operators and a solution of gutta-percha in oil of eucalyptol was used by them in its stead, as advocated by Dr. John Buckley. Many dentists have been using a solution of chloroform carrying rosin, to act as a solvent for the gutta-percha points when introduced and as a sealing material for the dental tubuli and foramina, suggested by the late Dr. Callahan, who has contributed so much to the problem of root fillings. It must be remembered that, if the pulp chamber is filled partly by fluid and partly by solid, the change in dimension of both of these must be taken into consideration. Gutta-percha dissolved in chloroform, to a consistency of a thick cream or thick paint, has a volume 300% greater than that of the original material, or, to express it otherwise, if the pulp chamber is filled with gutta-percha having the consistency of a heavy paint, when chloroform has evaporated from it, the chamber will be one-third full. If we put sufficient gutta-percha into this paint or cream to occupy 90% of the total volume, the chamber will still lack 6.6% of being filled after the chloroform has disappeared. Probably one of the greatest errors we have made, when thinking of gutta-percha in connection with a solvent like chloroform or eucalyptol, is the presumption that the softening of the surface of the gutta-percha cone with chloroform, in order to make it plastic and moldable to the form of the canal, does not materially change its dimension. The dimension is changed greatly with even a small amount of chloroform, as shown by these data. Gutta-percha dissolved in chloroform to form a paint has certain very definite qualities which we should study. It has adhesiveness while it contains an abundance of chloroform but loses this quality almost completely when the chloroform disappears from it. Consequently, root fillings made with this as a solvent tend to leave the walls and shrink toward a center within the mass, leaving the space caused by the shrinkage at the periphery of the mass. It was, doubtless, to overcome this quality that Dr. Callahan sought for and de-

veloped the rosin-chloroform preparation, and Dr. Buckley the eucapercha compound. Unfortunately the ultimate contraction is very great and corresponds relatively, whether the solvent used is chloroform, oil of eucalyptol, or chloroform carrying rosin. The gutta-percha in oil of eucalyptol (eucapercha), as supplied in the market, has a volume of 417% greater than the volume of the gutta-percha alone. In other words, a pulp chamber filled with eucapercha and submitted to long and complete drying would ultimately have 24% of the total volume of the pulp chamber filled. It solidifies into a lumpy and curdled mass and does not adhere to smooth surfaces. This extreme drying-out process, however, does not occur for a long period of time. After eight weeks of spontaneous air drying at room temperature, it reduces to 87% of the original. During a similar period gutta-percha and chloroform would have diminished to 76% of its original volume. It is only by the addition of artificial heat, which condition the body would furnish, that the rate is hastened. See tables. Moisture does not hasten it. Rosin and chloroform also undergo a very great reduction in volume when mixed to the consistency of a mobile fluid, approximately corresponding with sewing machine oil, as suggested by Dr. Callahan. It has a volume of 406% of the volume of rosin. In other words, if a pulp chamber were filled with a rosin and chloroform solution of the above consistency, it would ultimately only be 24.6% filled. The addition of gutta-percha cones to occupy say 90% of this total volume would still leave approximately 7.5% of the pulp chamber unfilled, when the complete drying out process has occurred. If a gutta-percha cone is placed in this liquid, it very rapidly swells so that it will occupy more space, soon expanding to ¼ more or to twice its normal volume, because of the softening process. The pulp chamber can only contain a given amount of material, whether fluid, semi-fluid or solid, and it is a physical impossibility to put in material to make up for the reduction in volume produced by the evaporation of the solvent, while the solvent is present. *It is, therefore, a physical impossibility to completely fill a pulp chamber with gutta-percha made plastic by any of the above solvents, except at the time the gutta-percha contains the solvent.* The chloroform and rosin compound has very distinct and favorable qualities in that it is very adherent and tenacious in all stages to both smooth and rough surfaces. It is unlike each of the preceding compounds in this respect. The result of this quality is that when a root filling is made of this material and gutta-percha cones, the contraction tends to express itself, in a large part, by a shrinking towards the walls if dry, rather than as a continuous disc at the side of the mass and between it and the wall, and herein lies the great virtue of this material as a means for filling pulp chambers.

It will be a matter of surprise, doubtless, to most of us to find that a skin is formed on the surface of each chloropercha, and rosin and chloroform, particularly the latter, which quite effectually delays the drying-out process. In a case of the chloroform and gutta-percha in a narrow chamber this skin or film separates from the vessel or container, leaving a fault which ultimately makes a series of caverns, each projecting from the last until the entire mass is honeycombed. In large chambers it contracts to a central free mass. Chloroform and rosin in a narrow chamber of the same form retains the continuity of the protecting surface skin by its adherence to the wall and underneath this film the liquid retains nearly its original fluidity, due to the control of the vapor tension by this membrane. Consequently, it is not only a matter of weeks but of

many months before our root fillings inserted with any of these three compounds will have attained their maximum contraction. After air drying in an open vessel for two weeks rosin-chloroform had reduced to 65% of its original volume; in five weeks 59%; eight weeks 36.4% and the last 12% of the total shrinkage requiring either a long period of time or the addition of artificial heat nearly to the boiling point of water for many hours. When we consider the great variety of forms of pulp canals and the variations in size, shape and direction of the many foramina, it is evident that either the root filling material must seal these foramina by a process of retreating while retaining a close adhesion to the surface of the foramen, instead of contracting to a common center of the mass, producing a fault or space. Different types of multiple foramina are shown in Figure 3 and Figure 4. In Figure 3 are seen two lateral canals each containing root filling material. Granting that all the tissue was removed from them, which is doubtful indeed, they would soon after root filling lack considerable of being completely filled, since the solution of gutta-percha which could be forced into them contained so much solvent, which would in time largely or entirely leave the mass. The space the solvent occupied would be open to periapical fluids either from the tissues or periapical space, unless a sealed joint is formed at the external opening of the canal. This sealing appears to form only on dry surfaces and only with the rosin chloroform of the above three methods. Figure 4 is a specimen made by Dr. Callahan and shows a large number of foramina. He found seventy-

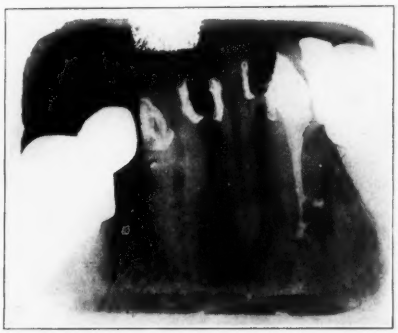


Figure 3.

Figure 4.

five in one tooth and several in most teeth.

ROOT FILLING EFFICIENCY TESTS.

During an extended period we have also been making observations and determinations as to the practical results that can be obtained by the various root filling methods for comparison with the above. A large number of extracted teeth that had been root filled months or years previously by splendid operators, were opened after extraction, cultures were taken from the root fillings and dentin, and they were almost universally found to be infected. This, however, did not mean so much, since they were

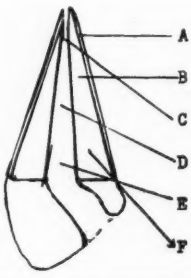
usually extracted because of known peridental involvement. We, accordingly, made a series of determinations of the efficiency of root filling materials when placed in sterile teeth to prevent the entrance into the pulp canal and dentin of infection placed externally. In this work we were assisted by Drs. Milton J. Damlos, on the staff at the Research Institute, and Thomas J. Hill, a practicing dentist, and finally by several dentists who kindly made operations for critical study. The results of these are included in the following tables:

ROOT FILLING EFFICIENCY TESTS.

SERIES NO. I.

60 Sterile teeth used.
Prepared by Dr. D.
Root filled by Dr. D.
Tested and cultured by Dr. D.

Root Filling Materials
Chloro-percha
Gutta-percha



		Efficiency
A	Cementum showed a streptococcus growth in 15%	85%
B	Dentin " " " " " 25%	75%
C	Root filling " " " " " 40%	60%
	Apical third	
D	Root filling " " " " " 60%	40%
	Middle third	
E	Root filling " " " " " 80%	20%
	Gingival third "	
F	Dentin	

Note—Teeth were boiled two hours. Gutta-percha points were heated to 180°C for one hour. Chloro-percha was heated in autoclave for thirty minutes at fifteen pounds. Root fillings were made under glass. Gingival end of canal was filled with gutta-percha. After root filling, teeth were placed in infected mixed cultures, frequently renewed and incubated for fifteen days at 37°C. Teeth were sterilized externally in full strength formalin and alcohol before opening. These results are immediate before contraction has had time to be completed.

SERIES NO. II.

11 Sterilized straight teeth used
Prepared by Dr. D.
Root filled by Dr. H.
Tested and cultured by Dr. D.

Root Filling Materials
Rosin-Chloroform
Gutta-percha

		Efficiency
A	Cementum showed a streptococcus growth in.....70%	30%
B	Dentin showed a streptococcus growth in.....90%	10%
C	Root filling showed a streptococcus growth in.....90% Apical third.	10%
D	Root filling showed a streptococcus growth in.....60% Middle third.	40%
E	Root filling showed a streptococcus growth in.....40% Gingival third.	60%

Note.—These results are immediate before complete contraction, due to evaporation of solvent. Efficiency would be less as time is extended. C, D and E refer to root filling infection.

SERIES NO. III.

No.	A	B	C	D	E	Rosin and Chloropercha	Chloro-percha	Paraffin	Growth	Efficiency
1		+	+	+	+		+		80%	20%
2							+		0%	100%
3	+		+		+		+		60%	40%
4					+		+		20%	80%
5				+	+		+		40%	60%
6		+	+		+	+			60%	40%
7			+	+	+			+	60%	40%
8	+		+	+	+	+			80%	20%
9		+	+	+	+			+	80%	20%
10			+	+	+	+			60%	40%
11					+		+		20%	80%
12							+		0%	100%
13				+			+		20%	80%
14					+		+		20%	80%
15	+						+		20%	80%
16							+		0%	100%
17				+		+			20%	80%
18				+			+		20%	80%
19						+			0%	100%
20				+			+		20%	80%
Percent	15%	15%	35%	50%	55%	Total 5	13	2		

Cementum near apex. Dentin near apex. Apical third of root filling. Middle third of root filling. Gingival third of root filling.

\+ indicates growth.

Note.—Out of twenty teeth only four equaled 100% efficiency, or a net efficiency of twenty per cent. These results are immediate before full contraction of root fillings.

SERIES NO. IV.

	Thymoxyl Root Filling.							
No.	A	B	C	D	E	F	Growth	Efficiency
1	+	+	+	+	+	+	100%	0%
2	+	+	+	+	+	+	100%	0%
3		+			+	+	50%	50%
4	+		+	+	+	+	80%	20%
5	+	+		+	+	+	80%	20%
6	+	+	+		+	+	80%	20%
7	+	+	+		+	+	80%	20%
8				+		+	30%	70%

Note.—No tooth was free from infection. Net efficiency, 0.0%. These results are immediate before full contraction is possible. Crown ends of roots were covered with paraffin after root filling. + indicates growth.

SERIES NO. V.

Pustolene Root Filling.

No.	A	B	C	D	E	F	Growth	Efficiency
			Areas.					
1	+	+	+	+	+	+	100%	0%
2	+	+	+	+	+	+	100%	0%
3	+	+	+	+	+	+	100%	0%
4	+	+	+	+	+	+	100%	0%
5	+	+	+	+	+	+	100%	0%
6	+	+	+		+	+	84%	16%
7	+	+	+	+	+		84%	16%
8	+		+	+	+		66%	34%
9	+	+	+	+	+		84%	16%
10	+	+	+	+	+	+	100%	0%
11	+		+	+	+	+	84%	16%

Note.—Net efficiency, 0.0%. Full contraction of root fillings had not taken place. Crown ends of roots were covered with paraffin to protect the root fillings.

ROOT FILLING AND CROWN FILLING EFFICIENCY TESTS.

SERIES NO. VI. (+ = growth)

17 Sterile teeth used. Root filling material chloro-percha and gutta-percha.
1 to 11 inclusive crown filling made of gutta-percha. Apex exposed.
12 to 15 inclusive crown filling protected by paraffin coating. Apex exposed.
16 to 17 entire tooth surrounded by paraffin, except apex. Apex exposed.

No.	A	B	C	D	E	Growth	Efficiency
			Areas				
1		+	+		+	60%	40%
2			+	+	+	60%	40%
3	+	+	+	+	+	100%	0%
4	+	+	+	+	+	100%	0%
5	+	+	+	+	+	100%	0%
6					+	20%	80%
7			+	+	+	60%	40%
8		+	+		+	60%	40%
9				+	+	40%	60%
10	+	+			+	60%	40%
11		+				20%	80%
12	+	+			+	60%	40%
13	+	+	+	+	+	100%	0%
14					+	20%	80%
15	+	+	+	+	+	100%	0%
16		+			+	40%	60%
17	+		+	+	+	80%	20%
	48%	65%	59%	53%	94%		

Note.—Net efficiency 0.0%. Full contraction of root fillings had not taken place.

SERIES NO. VII.

Made by five different dentists. + indicates growth.

Areas	#28	#4	#7	#10	#2	#11	#12	#13
A	+	+	–	+	+	+	+	+
B	+	–	–	+	+	–	+	+
C	+	+	–	–	+	–	–	+
D	+	+	–	–	+	–	–	–
E	+	–	–	+	+	–	–	+
F	+	–	–	+	+	–	–	+

Full contraction had not taken place.

In general the results are as follows: *When teeth were sterilized by autoclaving and kept moist until root filled by the various methods, in the short space of time of even two weeks, the great majority were found to permit the entrance of organisms* from the external surface into each pulp chamber, the root filling material and the dentin, notwithstanding the filling material and solvent used or its method of insertion. These results were obtained by placing the teeth, which had been root filled immediately or soon, into the infected culture medium for from a few days to two weeks and, accordingly, as bad as they are, these results certainly are much better than they would have been after the root fillings had been in place several months, which time is required for the complete contraction to take place. This suggests also that practically every tooth, the root filling of which is not protected from infection from the mouth by a competent barrier, is a direct port for infection to enter the body thru and past the normal defenses. There are several possibilities to be considered. Is it possible for the body always to withstand, without injury, the amount of infection that will enter the root when it is filled as well as possible? Is it possible to develop a technic that will

Figure 5.

effectually seal the bacteria from a large proportion of root filled teeth? Is there much hope of effectually filling the tortuous multi-canals of multi-rooted teeth in difficult and almost inaccessible parts of the mouth?

In Figure 5 we show a series of root fillings made by a splendid operator who said he thought he could fill 95% of multi-rooted teeth successfully. These

operations, tho better than most operators can make, are practically all failures from the standpoint of mechanically blocking the canals.

The teeth submitted to members of the profession for root filling were nearly all single rooted straight teeth, as shown in Figure 6, which also shows their root fillings.

The physical changes which occur in the various uses of gutta-percha are so great and so important that every dental operator should study them carefully, and for this purpose we give in full Professor Miller's detailed statements.

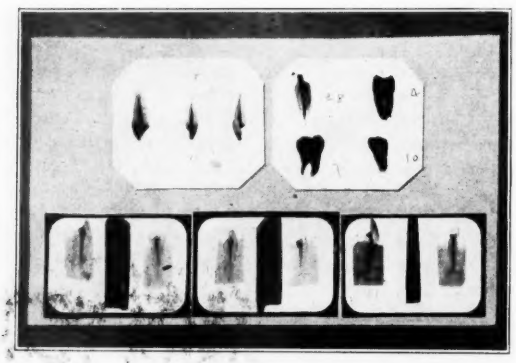


Figure 6.

Department of Physics
CASE SCHOOL OF APPLIED SCIENCE,
Cleveland, Ohio.

Dayton C. Miller.
Charles D. Hodgman.
Robert E. Snyder.

Report by Dayton C. Miller on the Expansion of Sheet Gutta-percha, submitted by Dr. Weston A. Price.

The gutta-percha material is in the form of sheets about 150x75x0.85 mm. in size, of two colors, drab and pink. The purpose of the investigation is to determine the coefficient of thermal expansion.

I.

PRELIMINARY VOLUME EXPANSION.

Experiments were made to determine the volume expansion by placing the material in a pyknometer bottle and filling the bottle with water; the bottle was heated and the relative expansion was observed on a graduated glass tube. By computing the expansion of the glass bottle and of the water, the expansion due to the gutta-percha was determined. The same experiments were made by filling the bottle with mercury instead of water, but there was great difficulty due to the air enclosed in the capillary spaces where the mercury came in contact with the pieces of material. After much trouble these methods were abandoned, since they gave anomalous and irregular results.

II.

AREA.

Experiments were next made with a sheet of the pink material about 75 mm. square. Lines were marked on the sur-

face forming a square 70x70 mm. This sheet was successively heated and cooled, and the dimensions of the square were measured.

The sheet contracted greatly in the direction which appeared to be that in which it was rolled in the process of manufacture, while it expanded laterally. The thickness was not measured in this experiment, but was measured in a repetition described later.

Table I gives the results of the measures:

sheet shrank about 5 mm. in length, being 65 mm. long, and 72.5 mm. wide.

Measurements were made at 64°C. and then at 70°C. (159°F.) At the latter temperature the material was very pliable, but not sticky. It was found to have changed in dimension to 57.0 mm. x75.5 mm.

At 76°C. (169°F.) the dimensions were 55.0x76.5 mm. The material became sticky and so soft as to take the impression of the finger tip. It seemed

TABLE I.

SURFACE EXPANSION OF SHEET GUTTA-PERCHA.

Temperature °C	Temperature °F	Dimensions after heat treatment	Remarks.
28	82	70 x 70 mm.	Same as at the start.
36	97	70.3 x 70.0	No contraction.
45	113	69.8 x 70.6	Pliable.
56	133	65.0 x 72.5	Sheet warped badly. Contraction so rapid it was clearly visible. Warp disappeared.
64	147	60.4 x 74.0	
70	158	57.0 x 75.5	Very pliable, but not sticky.
76	169	55.0 x 76.5	Begins to stick to plate. Takes impression of finger tips. Too soft for further measures.
78	173	55.0 x 76.5	Same as at 76°.
86	187	55.0 x 76.5	
91	196	55.0 x 76.5	
99.5	211	55.0 x 76.5	Boiled for several minutes.

Area before heating 4900 sq. mm.
Area after heating 4180 sq. mm.
Contraction of area 14.7%.

The results show that the material as received for the supply house is under great internal strain, some dimensions being too great, and some less than normal, and that the strains are progressively released by increasing temperature.

The first observation shows that at blood heat, 36°C, the strains are not at all released.

At 45°C. (113°F.) the material is slightly pliable, and the strains just begin to disappear.

At 56°C. (133°F.) the strains were relieved very considerably, so that at first the sheet was badly warped by unequal strain, and it was easily seen to shrink, with the unaided eye. The

unsuitable for measures at higher temperatures.

However, it was heated to 78°C., 86°C., 91°C. and 99.5°C. (211°F.) the boiling point. The dimensions did not change, but remained 55.0x76.5 mm.

The experiments show a progressive change in dimension beginning at a temperature of about 40°C. (104°F.) and continuing to a temperature of 76°C. (169°F.) In this particular specimen of material, the length of the sheet diminished about 21%, while the width increased about 9%. The area of the sheet diminished 14.7%, due to shrinkage produced by heating.

The actual size of the piece of material at the beginning and at the end of the experiment is shown in Fig. 7.

III.

Area and Volume.

A second experiment was made with a sheet of pink gutta-percha, as before, using a marked square 70x70 mm. The thickness of the sheet was carefully measured with calipers at eight places, and the average thickness is used in calculating volume. The measurements are shown in Table II.

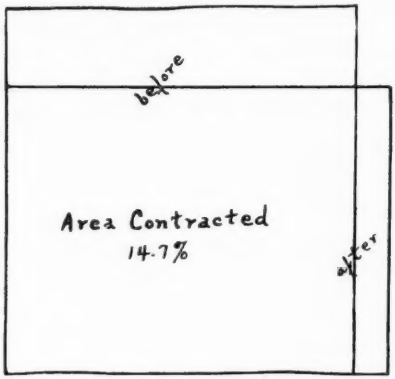


Fig. 7.—Shrinkage in area of a sheet of dental gutta-percha, due to heating to 76°C (169°F).

TABLE II.

EXPANSION OF GUTTA-PERCHA.

Temperature	22°C=72°F	56°C=133°F	85°C=185°F	99.5°=211°F Boiling
Length and breadth mm.	70 x 70	65.3 x 71.5	63.0 x 72.5	63.0 x 72.5
Area sq. mm.	4900	4669	4567	4567
Thickness mm.	0.843	0.890	0.916	0.912
Volume cu. mm.	4131	4155	4183	4165

These experiments lead to the same general conclusions as before tho the changes in dimension for this specimen are less than for the first. The length diminished about 10%, while the breadth increased about 3%. The changes had taken place before the temperature of 85°C was reached. Continued boiling in water for fifteen minutes did not produce any further change.

Taken in connection with the measure of thickness, the observations show that tho the area diminished very much, the volume does not vary appreciably. There is an apparent permanent increase in volume of less than 1%, but this may be due to the fact that the heat slightly roughened the surface, making the thickness appear too great.

IV.

Linear Expansion.

A piece of the drab colored gutta-percha was subjected to temperature treatment by heating and cooling several times to 55°C. and 75°C. and finally by boiling in water for fifteen minutes, and then it was cooled slowly. Fine marks were ruled near the ends of the sheet, 121.5 mm. apart.

This strip of material was placed on a special warming plate with arrangements for changing and controlling the temperature by circulating hot water.

The apparatus was placed on the Micrometer Microscope Comparator.

The expansion of the gutta-percha was directly measured with the micrometer microscope, with as great precision as possible. The observations were taken twice around a cycle of rising and falling temperatures. The average results of the measures are shown numerically in Table III and graphically in Fig. 8.

TABLE III.

LENGTH OF SPECIMEN IN MILLIMETERS.

Temperature °C	Temperature °F	Rising Temperature	Falling Temperature
23	73	121.502	121.510
30	86	.551	.688
35	95	.576	.738
38	100	.599	.748
45	113	.690	.759
50	122	.741	.764
55	131	.778	.770
60	140	.794	.780
65	149	.798	.790
76	169	.797	.797

Fig. 4.

The observations show that for rising temperatures the gutta-percha has a coefficient of expansion of 0.0000549 up to about 38° C. (100°F.) and a coefficient of 0.0000807 from 38°C. to about 55°C. (131°F); above 55°C. the expansion is very slow and practically vanishes at 75°C. (167°F). This agrees exactly with the measures made on the area of the sheet material as shown in Table I; the material becomes wholly plastic at

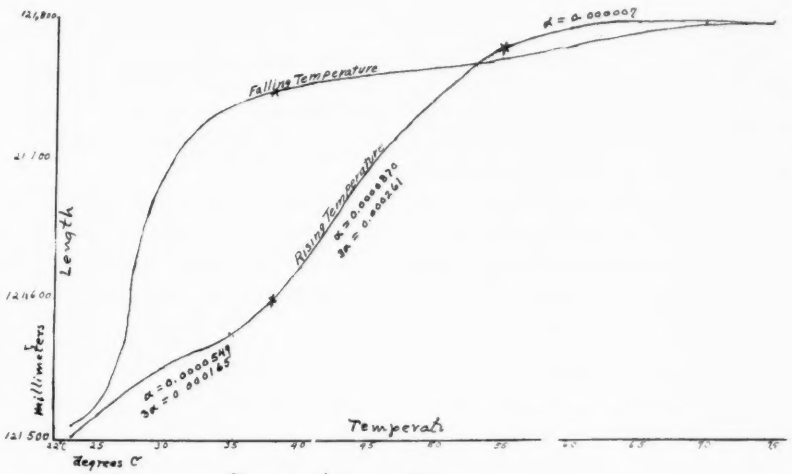


Fig. 8. Linear Expansion of Dental Gutta Percha

The coefficient of linear expansion and of volume expansion (equal to three times the linear expansion), computed in accordance with the data plotted in Fig. 8, are given in Table IV.

TABLE IV.

COEFFICIENTS OF EXPANSION OF GUTTA-PERCHA.

Temperature °C	Temperature °F	Linear Expansion	Volume Expansion
23-38	73-100	0.0000549	0.000165
38-55	100-131	0.0000870	0.000261
55-75		0.000007	0.000021

this temperature. The curve for falling temperatures shows a very decided lag in the contraction at the beginning. This may be due to very poor heat conductivity, which causes the temperature to lag, and it might disappear if the material remained a longer time at each temperature. Common experience with this material shows that after being softened by heat and then being apparently cooled to room temperature, its normal rigidity returns slowly.

V.

Remarks.

Before being used, this material should be "annealed" by being heated to a temperature of 75°C. (167°F.) Otherwise a long slender cone of the material might be placed in a cavity, and there might later be a contraction in length of 15% which would pull the cone out of the cavity.

If the upper end of the cone were softened with a hot tool, this end would probably be safely sealed.

If a cone of this material were "annealed" and then placed in a cavity at a temperature of 55°C. (131°F.) and then cooled to a temperature of 20°C., there would be a lateral contraction of 0.007 mm. (0.0003 inch) in a cone 3 mm. (about ⅛ inch) in diameter.

The results of the area measurements, Table I, agree remarkably with the linear expansion observations, Table III, and interpreted in Fig. 8. The material acts like a normal solid up to a temperature of 38°C., expanding at a uniform rate and without the peculiar contraction shown at higher temperatures. At 38°C., it may be that some ingredient of the composition begins to melt, causing a release of any existing internal strain and producing a large contraction in the unannealed and stretched material which wholly masks the regular thermal expansion. After annealing, however, the regular expansion occurs in increased amount from 38° to 55°. Above the latter temperature the material is in no sense a solid.

Respectfully submitted,

(Signed) Dayton C. Miller,
Professor of Physics.

Cleveland, Ohio, July 8, 1916.

VI.

Additional Expansion Experiments.

A piece of pink gutta-percha was "annealed" in boiling water for ten minutes with the following results:

The length diminished	18.0%
The width increased	7.7%
The thickness increased	15.9%
The area diminished	11.7%
The volume increased	2.4%

A piece of drab gutta-percha "annealed" in boiling water for fifteen minutes, was changed as follows:

The length diminished	17.4%
The width increased	7.6%
The thickness increased	14.8%
The area diminished	11.2%
The volume increased	2.2%

A piece of the latter material was measured as accurately as possible, to determine its volume, which was 4.764 cubic centimeters. The volume was then determined with precision by hydrostatic weighing, giving the results 4.760 cubic centimeters.

This result indicates that the measures so far reported have a precision of about one part in a thousand.

This material was then treated with chloroform, for determining the changes in volume; but the behavior of the solvent was such that it was necessary to proceed by a new method, described in the next section.

VII.

Effects of Chloroform on Gutta-Percha.

It was expected that chloroform might be slowly absorbed by the gutta-percha, but the first touch of the liquid produced a true solution, which proceeded very rapidly, the result being a kind of "rub-

ber paint." Any portion of the original material not yet dissolved retained its original elastic properties.

The material was wholly dissolved, and the solvent was allowed to evaporate slowly until the solution just began to set, and was just firm enough to hold its shape but could be easily indented. The volume of this thick solution was 11.085 cubic centimeters, by hydrostatic weighing.

This amount of material was then allowed to dry thoroly, the solvent being wholly evaporated. The volume was now 4.267 cubic centimeters.

There is thus an expansion of volume in the gutta-percha from a solid to the condition of a solution which is just firm enough to hold its shape, of about 260%.

After being dissolved in chloroform and then being dried till the solvent has all evaporated, the gutta-percha returns practically to its original elastic condition. In its original condition the gutta-percha is elastic and tenacious; the material dissolved and dried is inelastic and breaks very easily.

VARIOUS COEFFICIENTS OF LINEAR EXPANSION.

From Smithsonian Physical Tables: (dimension change for temperature change of 1°C).

Gold		0.000014
Silver		0.000019
Platinum		0.000008
Caoutchouc,	16°-25°	0.000077
Gutta-Percha,	20°	0.000198
Paraffin,	16°-38°	0.000130
Paraffin,	38°-49°	0.000477
White Wax	26°-31°	0.000312
White Wax	31°-43°	0.000486
White Wax	43°-57°	0.001523

From the experiments here reported:

Dental Gutta-Percha	22°-38°	0.000055
Dental Gutta-Percha	38°-55°	0.000087
Dental Gutta-Percha	55°-75°	0.000007

Respectfully submitted,

(Signed) DAYTON C. MILLER,
Professor of Physics.

Cleveland, Ohio, July 17, 1916.

Department of Physics
CASE SCHOOL OF APPLIED SCIENCE.
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Dayton C. Miller.
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George B. Obear.

REPORT BY DAYTON C. MILLER ON SOME PHYSICAL PROPERTIES OF DENTAL ROOT-FILLING MATERIALS.

I. GENERAL PROPERTIES.

Investigations were undertaken to determine the volume, density, contraction, hardness, and general consistency of several materials used by the dental profession for filling root cavities. The three materials tested were submitted by Dr. Weston A. Price and are described as follows:

A. Rosin dissolved in chloroform.

B. Gutta-percha dissolved in chloroform and eucalyptol oil, a proprietary preparation known as "Eucapercha."

C. , Gutta-percha dissolved in chloroform.

The first efforts were made to determine the rate of contraction, the density, and the firmness of the material, from its fluid condition as put into a tooth cavity, to the condition of being solid. To secure accuracy, and at the same time to approximate the form of a root filling, the materials were placed in cylindrical glass graduates each of a normal capacity of 10 cubic centimeters, but actually holding about 13 cubic centimeters. Each jar was provided with a glass cover having a ground joint, and was accurately calibrated. Fig. 9, shows the three jars, containing the materials, after some evaporation had taken place as described later.

After careful weighing, the covers from the glasses were removed and the solvents were allowed to evaporate at room temperature, standing in the sun-

light when practicable, (in May and June.) It was thought that the materials would shrink steadily in volume, and become solid in a few days' time; and by making weighings, volume tests and hardness tests at successive stages, the information sought could be secured. This expectation was not realized, for the evaporation proceeded very slowly, and for the gutta-percha materials in a very non-uniform manner.

After eight weeks of spontaneous evaporation in the air at room tempera-

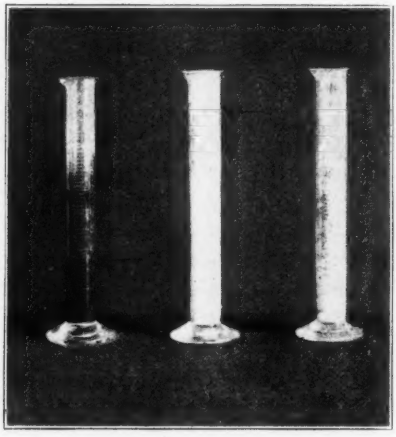

Fig. 9. Jars Containing Root-Filling Materials.

ture, the jars remaining uncovered during the whole time, the conditions were as shown in Fig. 9.

The *rosin-in-chloroform,* had steadily contracted in volume, but very slowly in the last three weeks. It was reduced to about one-third of the original volume, the surface being at the level indicated by the arrow at the side of the jar, the measured volume being 36% of the original. The inner surface of the jar above the mass of rosin was covered with a firm, adherent coating of rosin, which shows in the photograph as a discoloration of the jar above the arrow. The surface of the rosin was hard, but upon examination with a hard instrument, it was shown to be only a thin shell of hard rosin, not more than a half millimeter thick, while below this the material was still in a very fluid condition. The consistency of this fluid was that of a thin syrup, such as common maple syrup.

The *Eucapercha* had contracted much less, to about 86% of its original volume, indicated by the arrow. For about 12 millimeters near the top, the substance had assumed the consistency of dry chalk, a fine granular condition, and it had dried with the formation of cracks, like clay. Below this chalky deposit the material was in its original fluid condition with no evident thickening.

The *gutta-percha-in-chloroform* had contracted to about 75% of its original volume. The upper surface was hard gutta-percha. Upon touching this surface, it tipped over revealing the formation of a "plug" about 2 millimeters thick, with large irregular air spaces beneath. The material was, however, very fluid in the interior of the portions which appeared to be solid, and in the bottom of the jar it was as fluid as at first.

These results indicated that the necessity of forced evaporation, and the jars were placed in a water bath and subjected for various times to temperature of about 70°C. (169°F.) and 96°C (205°F.)

The conditions of these tests are best described for each material separately.

2. Rosin-in-Chloroform.

The rosin-in-chloroform at the beginning of the experiments was a mobile fluid of the consistency of sewing machine oil, having a density of 1.382. After two weeks of spontaneous drying its volume was reduced by about one-third, and the density was 1.358. The conditions of the material at the various stages of the experiments are shown in tabular form, Table V.

As the evaporation proceeded, the material left a tenaciously adhering coating on the walls of the jar, which shows in the photographs, Figs. 9 and 10, as a cloudy appearance of the glass jar above the line of the solid portion. It forms a coat of rosin-paint on the inside of the cavity which seems to be very permanent and which may be of great importance in dental uses. The evaporation to the solid state required long heating at temperatures much above body-temperatures

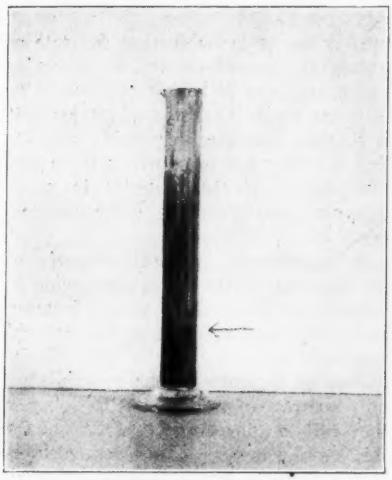

Fig. 10. Rosin-in-Chloroform. Evaporated in jar.

as shown by the Table. The final volume was 24.6% of the initial, as shown by the arrow in Fig. 10, and the final density is 1.14. The density of purified "violin bow rosin" was determined experimentally to be 1.07. This indicated the presence of some of the solvent even at the end of the experiment; or perhaps, the continued heat treatment drove off some of the natural, lighter, components of the rosin.

Experiments have been made to determine whether the rosin will harden more rapidly in water, on the possible supposition that water dissolved the solvent.

The results show that the water retards hardening, by preventing the evaporation of the solvent, and that its absorbing effect, if any, is imperceptible.

3. Eucapercha.

The eucapercha material used was in the original package, which had not been opened. The glass jar was filled with the material, there being 12.75 cubic centimeters at the beginning, the density being 1.432. The results of the experiments at the four principal stages are shown in Table VI. The appearance

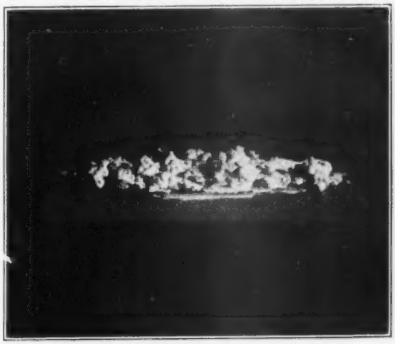

Fig. 11. Eucapercha. Evaporated.

after 8 weeks of spontaneous drying is shown by the middle jar in Fig. 9, and the material fully dried is shown in Fig. 11.

The peculiarities of this material showed in a tendency to curdle, or become granular (soft granules), and in drying on the surface to separate, forming drying cracks. The solvent seems to have destroyed to some extent the rubbery texture of the gutta-percha. This remains in the material when fully dried; it is much less tenacious than the gutta-percha treated with chloroform.

The material, in drying, contracts in about the same proportion as does the rosin, but it adheres very lightly, or not at all, to the walls of the glass jar. When

completely dried it is easily removed from the glass, the latter being left clean. This is in marked contrast to the rosin.

4. GUTTA-PERCHA-IN-CHLOROFORM.

The gutta-percha was dissolved in chloroform, producing a white paint, similar in appearance to the Eucapercha. The conditions of the material at the various stages are given in Table VII, and the final appearance is shown in Fig. 12.

This material dried by forming a hard surface layer, like ice, which even when thin, would almost wholly prevent

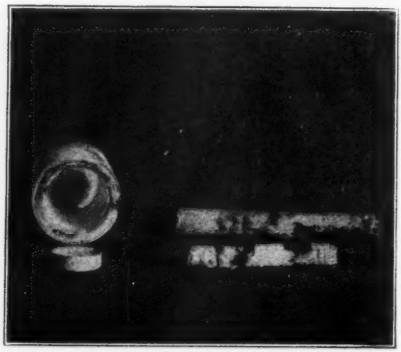

Fig. 12. Gutta-Percha-in-Chloroform. Evaporated.

further evaporation of the solvent. This action would be complete except for the contraction of the partly solidified material, which pulls away from the glass, and allows further evaporation thru the opening. This further evaporation takes place in pockets, producing a porous or cellular solid. This is clearly shown in the picture of the final condition, Fig. 12.

When the material dries in the bottle, it shrinks away from the edges and rounded corners, and does not form the inner pockets.

The peculiarities of this material are that it remains tenacious and rubber-like even tho it becomes filled with air bubbles; it does not become granular; and it does not adhere to the glass jar.

5. GENERAL REMARKS.

The first noticeable fact in the experiments was the extreme slowness with which evaporation proceeded under spontaneous air drying. It would have required a year, or more, for the materials in the jar to have solidified. Even when heat of 70°C. (169°F.) was applied, the process was not much accelerated. A temperature of boiling water was required, and this was sufficient to melt the rosin and to soften the solid gutta-percha.

It is not improbable that the rate of drying in a tooth-cavity, the walls of which are more or less porous, would be different from that in a glass jar. It is possible that the body-fluids may affect the rate; but experiments show that the placing of the material in water does not assist hardening, but rather prevents it.

A conspicuous physical property of the materials is the great contraction in volume, the final volume in one instance being less than a fourth of the original volume.

Both of the gutta-percha materials not only contract in volume, but in doing so they fail to adhere to the surface of the jar, leaving it clear of protecting covering, and the materials become porous or granular in structure. It would seem that these properties would render the materials useless for the filling of root cavities. As an illustration it may be assumed that root canals have diameters varying from 0.001 inch to 0.015 inch that is from 0.025 millimeters to 0.375 millimeters, and that bacteria may have a size varying from 0.0005 mm. to 0.005 mm. The possible contraction of fluid gutta-percha root-filling material in the smallest root canal may be 0.005 mm. while for a large canal it may be over 0.075 mm.; these contractions are much larger than the sizes of bacteria. While these statements of the contractions are not exact because of the uncertainties in the manner of drying, yet it is certain

that there will be little protection against the entrance of bacteria.

The rosin solution when drying differs from the other in that a solid coating remains tenaciously adherent to the whole inner surface from which the fluid has receded, and the solid does not at any time part from the walls. Thus the whole inner surface of the cavity remains protected, and no cracks are left where bacteria may enter thru the small canal. There is an inner hollow space, but it is wholly surrounded by the painted walls, and closed at the bottom by the solid.

These conclusions, however, are not final in regard to the filling of teeth, for the conditions in a living tooth are certainly different from those in the glass jar. But the facts of physical contractions, etc., are exactly the same in the two cases.

TABLE V.

ROSIN-IN-CHLOROFORM.

Test	Treatment	Density	Per cent of first volume	Per cent of final volume	Remarks on Condition.
a	Original material	1.382	100	406	Mobile fluid. Consistency of sewing machine oil.
b	After air drying for 2 wks.	1.358	65.5	266	Not noticeably different from first.
c	After air drying for 5 wks.	1.276	59	236	Consistency of thin syrup.
d	After air drying for 8 wks.	1.250	36.4	148	Layer of hard rosin tenaciously adheres to glass as fluid subsides.
e	After 25 hr. at 70°C(169°F)	1.230	34	139	Thick syrup, like common molasses. A layer of solid formed on top, like thin ice on water. Solid very thin.
f	After 60 hr. at 70°C	1.182	28	114	Like soft wax.
g	After 2 hr. drying at 96°C(205°F)	1.17	27.6	112	Rosin melted, so that whole becomes fluid. Upon cooling a surface layer of "ice" forms.
h	After 18 hr. drying at 96°C(205°F)	1.14	24.9	101	Very thick and sticky.
i	After 20 hr. drying at 96°C(205°F)	1.14	24.6	100	Solid but not brittle. Dark colored. Adheres tenaciously to glass over the whole interior of jar.

TABLE VI.

EUCAPERCHA.

Test	Treatment	Density	Per cent of first volume	Per cent of final volume	Remarks on Condition.
a	Original material	1.432	100	417	Consistency of paint. Very "soft" but not mobile.
b	After 8 wks. of spontaneous drying	1.486	87	362	Chalky at top for a depth of 12 m. m. with drying cracks. Below, of the original fluid consistency.
c	After drying 60 hrs. at 70°C (169°F)	1.530	80	333	Consistency of slightly curdled milk. Very little stickyness. Still "soft" to the touch, but not mobile.
d	After drying 20 hrs. at 96°C (205°F)	2.870	24	100	Solidified in lumpy or curdled form. Solid, but easily pulled apart. Does not adhere to the glass.

TABLE VII.

GUTTA-PERCHA-IN-CHLOROFORM.

Test	Treatment	Density	Per cent of first volume	Per cent of final volume	Remarks on Condition.
a	Original material	1.899	100	300	Consistency of paint.
b	After 8 wks. of spontaneous drying	2.02	76	230	A "plug" of solid gutta-percha on the top about 1 m. m. thick. Plug was tipped over, revealing fluid below, with air pockets forming.
c	After drying 60 hrs. at 70°C (160°F)	2.86	33.3	100	Solidified. Consistency of original gutta-percha. Does not adhere to the glass. Upon removal from the jar it was found with many air bubbles. See photograph.
	Residue of material left in bottle. Dried spontaneously. Original diameter 3.02 cm. Original thickness 1.29 cm.	2.86	33	100	Dried in a solid cake in the saucer-like bottom of the bottle. Final diameter, 2.42 cm. 80% of orig. Final thickness, 0.68 cm. 53% of orig. Final volume, 3.09 cm. 53% of orig.

NOTE.

Density of violin-bow-rosin.....1.07
Density of Chloroform.....1.48
Density of Ether.....0.72
Density of Gutta-percha.....2.90

Respectfully submitted,

(Signed.) DAYTON C. MILLER,
Professor of Physics.

Cleveland, Ohio, August 3, 1918.

It will be seen from the above detailed physical report by Dr. Miller, that *we are using materials which do not have the properties that our needs require. While contraction begins at once, it will continue slowly for months and possibly for years.* This probably explains why so many root filled teeth which at first seem normal fail months or years after root filling. *Exhaustive researches should be made to develop adequate root filling materials.*

The human body is an hermetically sealed container, the alimentary tract being an infolded tube and continuous with the exterior. Pulpless teeth are openings thru nature's protective armor and as such will be the port of entrance of infection into the body, unless they are hermetically sealed. These studies show that it is extremely difficult and in many teeth impossible to accomplish this with the methods and materials in vogue. Until we can do very much better than this report shows, no dentist is justified in devitalizing a healthy pulp except in case of most extreme necessity, and seldom, if ever, for ordinary bridge work. Every non-vital tooth, whether root filled or not, is, by the above, to be considered under suspicion and must be kept under observation. *An apparently-tolerant nature* has been entitled to much of the credit for the seeming success of dental root fillings. We have still to learn when nature is only *apparently tolerant.*

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VOL. 5 DECEMBER, 1918 No. 12

Editorial Department.

To Our Readers:
A Merry Christmas and a Happy New Year.

THE CHRISTMAS SEALS AND $53,000 FOR THE RELIEF FUND.

The aim of the Relief Committee is to secure a total of $53,000 from the sale of Christmas seals this year. This committee was greatly pleased and encouraged with the fine spirit of loyalty and sacrifice made last year for this worthy cause. At this Christmas time, nearly 27,000 dentists have already received a one dollar package of Christmas

stamps. Every dentist should return his check for these stamps. He should be too patriotic and loyal to his profession to return the stamps. We are confident that very few men will refuse to support this noble work.

No organization will make permanent progress if it fails to show due respect and honor to its pioneers and war heroes. The true brotherly spirit will be a thermometer of our permanency and soldarity as a professional organization. The Relief Fund Committee sends the following Christmas message to all patriotic and professional-loving dentists:

"To Members of the National Dental Association:

As announced in our last annual report, we reserve our appeal for the Relief Fund, by which we stand pledged to relieve our unfortunate members, to the commemorative season of Peace on Earth, Good Will to Men.

Inspired as we are today, by near realization of an enduring peace, let us in our anthems of thanksgiving, include our fellows by practical good will. The past year has demonstrated the fact never before realized in finance, millions are as easily obtained by solicitation as thousands were five years ago. Our people are inspired by ever increasing calls for aid to go over the top in every instance; how easy then, by just a bit of thought, with desire to lend aid and happiness at this Yule-Tide season, to increase our Relief Fund by a twenty-two thousand dollar Christmas gift, which will give us an even fifty thousand dollars in the Fund; then we can prove our ability to render real substantial relief.

With our present membership of nearly twenty-two thousand, a drive of twenty thousand dollars should, and can be, dead easy. Let the appearance of the Christmas seals represent the call of an active Committee with which we are all so familiar, and the deed is done.

Yours for the Committee,

L. G. NOEL,
WILLIAM T. CHAMBERS,
JAMES McMANUS,
E. S. GAYLORD, Chairman."

We are sure that every dentist who reads the fine sentiment expressed in the above letter and realizes the necessity and object of this worthy fund will heed its message.

Hundreds and hundreds of letters have been received enclosing from one to fifty dollars for this fund, and commending the National Dental Association on the magnanimous spirit and shrewd business ability manifested in the establishment of this Relief Fund to properly care for indigent members of the dental profession. We quote a few excerpts from letters which give an unanswerable argument for the necessity of this worthy cause:

"I cheerfully enclose my check for food for the living. A dead man can't smell flowers."

"This noble work represents the milk of human kindness. Five dollars enclosed."

"It gives me a great deal of pleasure to enclose $50.00 for this worthy cause."

"We have crushed the Hun, the war is over. Thank God for the men who did it. $5.00 enclosed."

Your contribution will show your loyalty and devotion to a noble cause and prove that you are aiming to be your brother's keeper. RETURN YOUR CHECK AND NOT THE STAMPS.

Notice—Tomorrow; today will be yesterday. Send your Relief Fund Christmas Fund check today.

AMERICAN RED CROSS.

Dental Ambulances and Christmas Roll Call.

"Go to the dental ambulance and have your teeth fixed," said the lieutenant to the private, and within a few minutes the private was relieved from excruciating pain which had incapacitated him for efficient service as a soldier. The dental ambulance was the property of the American Red Cross, one of many such appurtenances in this strictly up-to-date war.

The first of these dental ambulances was equipped thru the efforts of Mrs. William B. Thompson and given by the Red Cross to the league of 16,000 dentists who had pledged their services gratis for army work.

This ambulance has all the equipment of the modern dental office, with the added advantage of being able to visit the patient in all sorts of out-of-the-way places. It consists of a main operating room and two good-sized tents. Every contrivance approved by the dental profession is installed in the ambulance.

In the center room, or office proper, is a complete dental outfit, with separate bracket for instruments, electric engine, fountain cuspidor, pressure tank with syringe and sprays, hot and cold water faucets, steam sterilizer, filter, vulcanizer, electric lathe, blow pipe, nitrous oxide and oxygen gas apparatus, sanitary cabinet for instruments, a full set of operating forceps and a double set of dentist's instruments. There is even a typewriter for office records.

The car is lighted by electricity generated by batteries, built espec-

ially for the ambulance. Should they fail, provision is made for acetylene gas lighting.

When the car is in transit a field outfit, which closes up in three containers, is stored in the office. This is set up so soon as the car is ready for service. On either side of the office is a tent, one used for the field outfit, the other converted into sleeping quarters, or it may be used as an adjunct operating room.

While dental treatment is being given in the office, one of the tents may be used for the more difficult operations. The car is manned by a crew of two officers, two dental assistants and a chauffeur. In hot weather the sides of the tent may be rolled up, insuring the patient all possible ventilation.

One of these ambulances is in active service at Camp Upton. In all camps, newly arrived draftees carry with them trifling ailments—measles, mumps, and the like. The men are quarantined and as they cannot go to the dentist, the latter visits them.

Camp Meade has a dental ambulance, the gift of the Cleveland Unit of the Preparedness League. The Connecticut Unit provided funds for another. The Red Cross has thirteen of the dental ambulances. Three of them are in service in France and the others are on the way.

This is only one small phase of Red Cross service in the war. Its scope extends to the uttermost ends of the earth. In France it will have spent more than $71,000,000 by the end of this year in the service of humanity.

To continue this service, the Red Cross must have the united support of the American people and with this end in view it will hold its Christmas Roll Call during the week of December 16 to 23. It is hoped that then every American will join the Red Cross as a unanimous pledge to all the world that our resources, our sympathies and our active work is for those stricken by war. The Roll Call will constitute a reconsecration of the whole American people, an inspiring reassertion to mankind that in this hour of the world tragedy, not to conquer but to serve is America's supreme aim.

Every **patriotic dentist** will report "present" on this Christmas Roll Call of the American Red Cross.

Notice—Tomorrow; today will be yesterday. Send your Relief Fund Christmas Fund check today.

DENTAL SCHOOL FOR GRADUATE INSTRUCTION OF DENTAL OFFICERS, U. S. NAVY, GREAT LAKES NAVAL TRAINING STATION.

In line with the educational policy adopted some years ago, in the United States Navy, which after all is one vast school, is the recent launching of a school for graduate instruction of the dental officers at the Great Lakes Naval Station, Illinois.

It is needless to say that this project has the sanction of Secretary of the Navy, Josephus Daniels, and Surgeon General W. C. Braisted.

The object of this school is two-fold, namely, first, the training of civilian dentists upon entering the service in military, executive and clerical work absolutely essential to naval life, a review of basal subjects such as Practical Anatomy, Physical Diagnosis, Bacteriology, Pathology, Materia Medica, Pharmacology, etc., and the application of such principles and practice of Oral Surgery and Splint Work, Oral Pathology and Diagnosis, Focal Infection and Operative Dentistry as are best suited to Naval needs in peace and war.

Second, and quite as important, is the rotation thru the school at stated intervals of all officers in the service, who by virtue of their duties or isolation have lost touch with the latest thought of the dental profession along practically the foregoing curriculum, to the end that every officer and enlisted man in the service shall personally receive the benefit of all that is best in modern dentistry.

Professional dentistry and all of the Naval personnel should appreciate the pioneer efforts in this direction of Lieutenant Commander William N. Cogan, Dental Corps, U. S. N., and Lieutenant Commander Anson F. McCreary, Dental Corps, U. S. N. These two men, with far-seeing vision for present and future needs of the Dental Corps of the Navy, deserve the commendation, not only of the Corps and the Navy personnel, but of the whole dental profession for their unselfish activity in laying the foundation and promoting this important educational movement in behalf of advanced Naval Dental Service.

Lieutenant Commander Cogan has been an educator during his entire professional career and was formerly Dean of the Dental School of Georgetown University, Washington, D. C. He entered the Regular Dental Corps of the U. S. Navy October 13, 1912, and is its Dean, directing all its activities in conjunction with the Surgeon General in the Bureau of Medicine and Surgery.

Lieutenant Commander Anson F. McCreary, the active head of the school, has been in the Regular Naval Service since 1913 and was ordered to the Great Lakes Naval Training Station in March, 1917, where for a

time he was the only dental officer. He has organized and developed the dental service at the Station until, at the present time, he is Senior Officer of a staff of more than fifty dental officers and he has always taken the keenest interest in all that pertains to the welfare and advancement of the Dental Corps. Associated with Dr. McCreary is his able executive officer, Lieutenant Commander Edward E. Harris, who teaches Naval Customs, and Lieutenant (j. g.) Clarence R. Chandler who instructs in Clerical Work, both of the Regular Corps.

The Reserve Force is represented by Lieutenant (j. g.) Clarence J. Grieves teaching Oral Pathology and Focal Infection and Lieutenant (j. g.) Charles W. Rodgers teaching Materia Medica and Therapeutics.

Of the latter, Dr. Grieves was previously associated with the Baltimore College of Dental Surgery and Chief of the Dental Staff of John Hopkins Hospital, and Dr. Rodgers was lecturer in the Forsyth Dental Infirmary. Both of these officers have given up their several careers and entered the service looking only to the service and to assist in the Naval Dental School.

It is thus indeed a fortunate coincidence for the dental status in the Navy, which placed two such interested and capable officers as Drs. Cogan and McCreary in positions where they could work to a common end in the development of a school, and it is desirable that the various departments and bureaus should understand, appreciate and give their support to this educational effort.

Under the conditions prevailing at the Station, it has been necessary to instruct the first class in part at the Northwestern Dental School in Chicago. The school freely tendered laboratory and teaching facilities. The second class about to begin will have the further advantage of the assistance of the faculty of the Chicago College of Dental Surgery, and others.

With the permanent establishment of the Navy Dental School, service in the Navy should prove most attractive to the highest type of young professional men who, with increasing facilities, may find their congenial life work.

However, it is quite obvious that such a Naval Dental School should be located somewhere on a permanent basis for the following facts briefly stated:

1. The school has already been established and proven a success, both from a military and professional standpoint.

2. For the good of the professional service rendered to the enlisted men.

3. There are now over 500 men enlisted in the Dental Corps which is larger than the Medical Corps was at the beginning of the War.

4. Every dentist in the Corps should receive the benefits of all that is best in modern dentistry so as to unify and coordinate the entire Dental Corps.

5. This Naval Dental School could be permanently established in connection with the Medical School at Washington, D. C., without any additional expense to the Government.

Therefore, why not permanently locate the Naval Dental School in Washington, D. C., with all the dignity of the Naval Medical School?

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DEMOBILIZATION OF THE STUDENT ARMY TRAINING CORPS BETWEEN DECEMBER 1 AND 21, 1918.

Following the enactment of the man-power law extending the requirements of the selective service regulations to include practically all men of college age, units of the Student Army Training Corps were established in the approved colleges of Arts and Sciences. Later, the War Department decided to establish such units also in well-recognized dental schools. Dental students were already enlisted in the Medical Enlisted Reserve Corps and were exempt from the draft, but were now ordered to active duty and transferred to the S. A. T. C.

This man-power law extending the draft age from eighteen to forty-five was not enacted until August. This made it necessary for the Government, thru the Committee on Education and Special Training, to work out an elaborate plan, to save dental students from the draft, in an incredible short space of time. However, the dental schools began at once to carry out the orders and in every way possible cooperating with Governmental regulations—providing barracks, mess, drill and changing schedules, etc. The Government was to provide housing, sustenance, uniform, tuition and the pay of a private. It proved to be a Herculean task to change students from civilians to a military status—questionaires, physical examinations, inductions, waiting in line, delay in receiving orders, etc., took most of the students' time for the first four or five weeks in school—time which otherwise would have been spent in study. The placing of eleven and six hours a week of military training into an already over-crowded schedule—with night classes in War Aims courses, etc., added to the confusion. Other difficulties such as the assignment of students to guard duty, washing dishes, scrubbing floors

and doing general kitchen police duties not only added to the confusion but produced dissatisfaction among members of the student body and faculty.

Then, in the midst of this already chaotic condition, came the epidemic of influenza. As a consequence, the work of the students in the S. A. T. C. in most dental schools has not been satisfactory.

The signing of the armistice, which means a termination of the war, takes away the necessity for further interference with dental education. The S. A. T. C. was established as a war measure and we are assured that the War Department will soon issue an order demobilizing the S. A. T. C. in all professional schools.

Finis.

Since writing this editorial, the following order has been issued which demobilizes all of the Student Army Training Corps:

"Commanding officers of all units of S. A. T. C., both sections A and B, have been directed to demobilize and to discharge their men commencing week of December 1 with a view of completion of discharges by December 21.

Signed by ROBERT I. REES,
Brigadier General, General Staff, U. S. A.,
Committee on Education and Special Training."

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ALL RESTRICTIONS ON THE USE OF GOLD AND PLATINUM IN DENTISTRY REVOKED.

The War Industries Board has removed all restrictions on the use of gold and platinum in dentistry. The dental profession can now have its full gold and platinum requirements. The War Industries Board also requests that no more scrap platinum be sent to the Government. The following official order is self-explanatory:

REVOCATION OF SO-CALLED PLATINUM RULES AND REGULATIONS, DATED AUGUST 17, 1918.

The following communication has been received from the War Industries Board:

November 15, 1918.

1. The following Order was issued November 14, 1918:

"Because no longer required for the Public Safety, the Director of the Bureau of Mines, in charge of Explosives Regulation, has made the following changes in the General Information and Rulings under the Act of October

6, 1917 (40 Stat.—385), and as amended by the Sundry Civil Act of July 1, 1918.

1. All regulations relating to ingredients not used or intended to be used in the manufacture of explosives are revoked and no further license of such ingredients will be required.
2. All regulations relating to fireworks are revoked and no further license of fireworks will be required.
3. All regulations relating to Platinum, Iridium and Palladium, and compounds thereof are revoked and no further license of Platinum, Iridium and Palladium will be required.

Very truly yours,

CLARENCE HALL,

Chief Explosive Engineer."

Approved:

VAN H. MANNING, Director.

Approved:

FRANKLIN K. LANE, Secretary of the Interior.

2. The effect of the foregoing Order is to render void any license heretofore issued to you under the so-called Platinum Rules and Regulations, dated August 17, 1918; to render unnecessary further compliance with said Rules and Regulations; and to terminate the necessity for securing further licenses thereunder.

3. The foregoing Order shall not operate to relieve any person upon whom an order requisitioning Platinum, Iridium and Palladium, or compounds thereof, may have been served, from any obligation imposed upon him by such order.

PLATINUM SECTION,
C. H. Connor, Chief.

CONSERVATION OF TIN AND LEAD FOIL.

The United States War Industries Board has asked the American Red Cross to establish a bureau of Conservation in each chapter to carry on a campaign for the collection of tin and lead foil as the country is facing a shortage of 5000 tons of tin.

The Red Cross appeals to every dentist to save all tin foil and used collapsible tubes and donate them to the Red Cross thru the Conservation Bureau, 179 North State Street, Chicago, Ill.

The metal thus salvaged will be sold to the government at the market price.

Altho the war is virtually over, peace is not signed and the war will not be over as far as the Red Cross is concerned until our boys are back in this country.

Your government needs the tin—Your Red Cross needs the money. Will you co-operate?

PUBLICATION OF THE 1918 TRANSACTIONS OF THE NATIONAL DENTAL ASSOCIATION.

The complete transactions of the twenty-second annual session of the National Dental Association, held in Chicago, Illinois, August 5-9, 1918, will be published in book form, in paper cover.

The Government order reducing and restricting the amount of paper to be used in The Journal for the coming year makes it necessary for us to publish the minutes of this great meeting under separate cover. These transactions will contain not only all of the minutes of the General Sessions, House of Delegates and Board of Trustees, but will also carry many historical illustrations such as half-tones of all the presidents of the American Dental Association, the Southern Dental Association and the National Dental Association; pictures of our honorary members and distinguished guests; several pictures of the Black Memorial, and other interesting pictures of this meeting.

A copy of these transactions will be sent to anyone upon receipt of fifty cents in stamps, if the order is received prior to January 1, 1919.

HOW TO SECURE AN INDEX TO THE 1918 VOLUME OF THE JOURNAL.

The Government has limited the amount of paper to be used in The Journal—making a ten per cent decrease. In complying with this order from the Government for the conservation of paper, it is necessary that the annual or volume index, which otherwise would appear as a part of this issue, be published in pamphlet form.

It is imperative that those who desire a copy of this index, send in their order immediately as only a limited number will be printed.

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Army and Navy

SECRETARY BAKER TO GENERAL GORGAS.

October 26, 1918.

My Dear General Gorgas:

Your official term as Surgeon General of the Army having expired, I beg leave to express to you the appreciation of the Army and the country of the distinguished services which you have rendered during your long and brilliant career as a medical officer. Even the gracious modesty which is a part of your habit of thought cannot keep you from realizing that your career has been one of brilliant distinction, and that the Medical Department of the Army has profited from your services, as it has been honored by your deservedly high reputation. The operation of law has terminated your period of active service, except for the emergency work which you are now doing under my direction, but it will be a source of satisfaction to me and a comfort to the people of the country to realize that your interest will continue in the Army and in the great scientific researches in which your life has been engaged.

If I may add a personal word to this note, I beg you to accept my grateful acknowledgment of the cordial and helpful relations which have existed between us officially, and to thank you for the many personal courtesies and kindnesses which I have received from you during our most happy association.

I am placing a copy of this letter in the hands of the Adjutant General in order that it may become a part of your record in the department, and may there remain as an evidence of the complete success with which you as a soldier and a doctor have thru long years and under varying and difficult conditions served your country.

Cordially yours,

NEWTON D. BAKER,
Secretary of War.

Major General W. C. Gorgas, Washington, D. C.

—*Army and Navy Register, Nov.* 2.

RETURN OF AMERICAN TROOPS.

The announcement by the Shipping Board that the return of American troops composing the expeditionary forces will be accomplished within three months after it is determined that they may be safely withdrawn from the theaters of of war, has been read with considerable amusement by officials of the War and Navy Departments. When it is recalled that the transporting of troops and war material has required more than one year of intensive effort and fully 70 per cent of the undertaking has been randled by our allies, it is interesting to know how the Shipping Board officials expect to do the job in three months. The British and French have helped us by placing their ships at our disposal when their actual needs called for all available tonnage. American man power

was a vital factor, and our allies very generously made the transportation problem possible. The return of our soldiers will not be a vital necessity, and practically all of the foreign vessels used in this connection will no longer be available. Our soldiers, in the meantime, will be supplied with the necessary food and equipment and will no doubt be content to wait the orderly progress of their return as fast as accommodations are available, but certainly not within three months from the beginning of that operation.—*Army and Navy Register, Nov. 2.*

FEEDING OUR SOLDIERS.

Treasury Department,
Washington, Dec. 1, 1918.

Dear Friend:

The best soldier in the world can't fight unless he is well fed. The saying that an army marches on its belly is just as true today as as it was a hundred years ago.

The Subsistence Division of the Quartermaster Corps sees to it that the forces in camp here in the United States do not lack the best food, but the real passion of that department is the American Expeditionary Forces. The motto of the Subsistence Division—which feeds the army is "We Never Sleep." One afternoon a little while ago an order came about five o'clock for 24,000,000 rations. Within 24 hours, the entire order was placed, and the supply was well under way. 24,000,000 rations would give 2,000,000 soldiers three meals a day for four days.

The needs of the men in the trenches and on the firing line are given most careful consideration, and every effort is made to serve hot meals. Under barrage fire and gas attacks, however, hot food can not be carried forward. To meet this difficulty sealed containers are provided, holding sufficient food for 25 men for a day. These containers are absolutely air-tight to prevent poisoning of food by gas, since food tainted by gas causes death. In these containers are a dry, hard corn bread, corned beef, corned beef hash, roast beef, salmon, sardines, salt, sugar and coffee that is soluble in cold weather as well as in hot, together with the necessary can openers. The container weighs 107 pounds and is cleverly camouflaged.

An emergency ration corresponding to the Iron ration of the British troops has been worked out by the Americans. This is the ration that is carried over the top, and is only used in dire extremity. It consists of ground meat and wheat pressed into a cake, also a block of sweet chocolate. The cake can be eaten dry or stirred into cold water. If boiled a few minutes in three pints of water it makes a nourishing soup, or in one pint of water a palatable porridge.

No chances are taken on our troops going hungry because of submarines or thru accident or mishap. If not a single boat load of food landed in France for three months the huge reserves we have there now would take care of our men.

Every inch of available tonnage space has been utilized to put these mighty stores of food in Europe, and successful efforts have been made to supply our forces with fresh vegetables from the allied countries. As a reinforcing measure, 16 million pounds of dehydrated vegetables have been contracted for by the United States, for use in emergency only.

No losses at sea or failure of crops in allied countries can deprive our soldiers of their necessary potatoes.

The United States army is not only the best fed and the healthiest army in the world, it is also the best paid. The private soldier receives base pay at the rate of one dollar a day which is ten times as much as the German soldier, nearly three times as much as the British soldier, and twenty-five to fifty times as much as the Italian soldier. Our Sergeants receive $1.27 a day, twice the pay of a British Sergeant, more than six

times that of a French Sergeant, and between three and four times that of a German Sergeant.

The General in the American army, which is the rank of General Pershing, receives $883.33 per month, twice the pay of a German General and a little less than twice that of a French General, but less than the base pay of a general in the British army, which is $1380 a month. A lieutenant-general in the American army gets $750 a month, while the same officer in the British army gets $850; the ranks of officers in the American army receive pay at a higher rate than officers in other belligerent countries.

Base rate of pay per day of enlisted men of

	U. S.	G. Britain	France	Italy	Germany
Private	$1.00	$ .30	$ .05	$ .02-.04	$ .10
Private, 1st class	1.20	.50	.085	.05-.10	.25
Sergeant	1.27	.64	.20	.40-.80	.35

Base rate of pay per month of officers:

2nd Lieut.	$141.67	$ 39.00	$ 60.00	$ .30-.60	$ 30.00
1st Lieut.	166.67	48.00	70.00	.40-.70	38.00
Capt.	200.00	86.00	80.00	.60-.90	90.00
Major	250.00	115.00	90.00	.80	130.00
Lieut. Col.	291.67	135.00	165.00	.95	170.00
Colonel	333.33	145.00	142.00	1.26	176.50
B. Gen.	500.00	400.00	200.00	1.60	203.00
Maj. Gen.	666.67	525.00	300.00	1.90	260.00
Lieut. Gen.	750.00	850.00		2.40	267.00
General	833.33	1380.00	490.00		357.00

Yours very sincerely,
ANTOINETTE FUNK,
Director Speaker's Department,
National Woman's Liberty Loan Committee.

ARMY MEDICAL DEPARTMENT.

Changes in the duties of the officers of the Army medical department in the important billets in this country, expected as a result of the appointment of General Ireland as surgeon general of the Army, are destined to be made with great deliberation, if any are made at all to any extent. General Ireland proposes to proceed without violence in his administration to the affiairs of the department, and so far only the necessary orders are being issued. The most important of the week is the assignment of Colonel Winford Smith, formerly superintendent of the Johns Hopkins Hospital, as head of the hospital division of the surgeon general's office as the successor of General Noble, who has gone to France. General Ireland has been succeeded as chief surgeon of the American Expeditionary Force by Colonel Walter D. McCaw, it has been announced. It is not made known to what duty General Noble will be assigned.— *Army and Navy Register, November 9.*

ITALY HONORS GENERAL GORGAS.

In recognition of his distinguished services in behalf of military sanitation, Major General William C. Gorgas, until recently Surgeon General, United States Army, has been made a Grand Officer of the Order of the Crown of Italy. The ceremony of presentation took place November 5 in the office of the Surgeon General, the order being presented by Major General Emilio Guglielmotti, military attache of the Royal Italian Embassy.— *Army and Navy Register, Nov. 9.*

U. S. NAVAL TRAINING STATION, GREAT LAKES, ILLINOIS.

The following Dental Officers, Regular and Reserve and Civilian teachers comprised the official personnel of the active faculty instructing the first graduating class of the school:

FACULTY.

Lieutenant Commander Anson F. McCreary, Dental Corps, U. S. N., Dean and Instructor in Navy Regulations.

Lieutenant Commander Edward E. Harris, Dental Corps, U. S. N., Executive Officer and Instructor in Naval Customs and General Information.

Lieutenant (j. g.) Clarence A. Chandler, Dental Corps, U. S. N., Instructor in Clerical Work and Forms.

Lieutenant (j. g.) Clarence J. Grieves, Dental Corps, U. S. N. R. F., Instructor in Oral Pathology, Focal Infection and Diagnosis.

Lieutenant (j. g.) Charles W. Rodgers, Dental Corps, U. S. N. R. F., Instructor in Materia Medica, Pharmacology and Therapeutics.

Lieutenant James C. Walker, Medical Corps, U. S. N., Instructor in Physical Diagnosis; Laboratory.

Lieutenant (j. g.) C. A. Koeningsberger, Medical Corps, U. S. N., Instructor in Specific Oral Lesions; Laboratory.

CIVILIAN TEACHERS.

Thomas L. Gilmer, M. D., D. D. S., Northwestern University, Instructor in Operative and Clinical Oral Surgery.

Carl Beck, M. D., Chicago, Ill., Instructor in Operative and Plastic Surgery.

LeCount, M. D., Northwestern University, Instructor in Anatomy and Plastic Surgery.

E. H. Hatton, M. D., Northwestern University, Lecturer in Focal Infection and Bacteriology.

George E. Meyer, D. D. S., Chicago, Ill., Lecturer in Gun Shot Wounds and Treatment.

Hilles Talley Brown, D. D. S., Northwestern University, Instructor in Anatomy, Dissection.

F. W. Merrifield, D. D. S., Chicago, Ill., Instructor in Local and Conductive Anesthesia.

Joseph E. Ridgeway, D. D. S., Northwestern University, Instructor in Fracture and Splint Appliances.

Roscoe L. Stout, D. D. S., Northwestern University, Instructor in Fracture and Splint Appliances.

GRADUATES GREAT LAKES NAVY DENTAL SCHOOL.

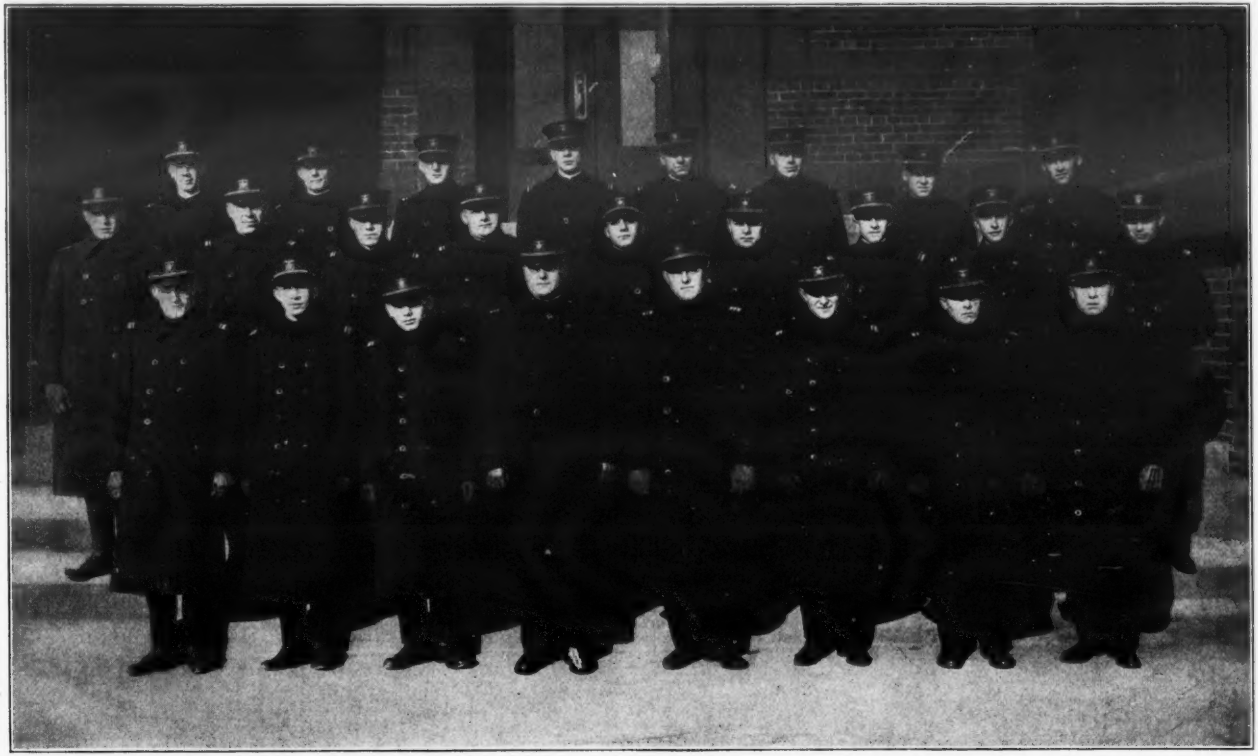
Lieutenants (j. g.) Dental Corps, U. S. Navy, who graduated in the first class of the Navy Dental School, Great Lakes, Illinois. All but two of these Dental Officers belong to the Reserve Force: Souter, A. L.; Bailey, R. J.; Hursh, H. S.; Duncan, H. B., U. S. N., Tambling, A. R.; Kelly, J. A., U. S. N., Messner, K. W.; Campbell, F. E.; Tagland, O. J.; Turnbaugh, F. E.; Pecaro, A.; Whitaker, V. D.; Heely, E. Q.; Cohen, M.; Chandler, C. A., U. S. N.; Miller, H. C.; Dampier, D. G.; Bourquin, J. W.; Spiro, B.; Hittinger, F. R.; Kalen, H. L.; McCarthy, T. J.; Wickham, H. C.; Forth, W. S.; Speer, T. W.; Varner, E. C.; Kiesendahl, E. J.; Feike, L. V.; Holland, C. P.

SOLDIERS BRUSHING THEIR TEETH.

The generation of American mothers that have trained their boys to care for their teeth as the people of no other country do, would glow with pride if they could trek up in the wake of our Army in action and see the whole rear area dotted at sunrise with Yankee soldiers, just out of battle, and every man brushing his teeth. Often most of his possessions have been jettisoned in the rush of the advance.

And now abideth these three, the rifle, the shovel, and the tooth-brush. And the greatest of these—

—From French Publication.



LIEUTENANTS (J. G.) DENTAL CORPS, U. S. NAVY, WHO GRADUATED IN THE FIRST CLASS OF THE NAVY DENTAL SCHOOL, GREAT LAKES, ILL.

THE NURSE.

Lucy Helen Pearson, Chicago, Ill.

The world grows better year by year,
Because some nurse in her little sphere
Puts on her apron and grins and sings,
And keeps on doing the same old things.

Taking the temperature, giving the pills,
To remedy mankind's numerous ills;
Feeding the baby, answering bells,
Being polite with a heart that rebels.

Longing for home and all the while,
Wearing the same old professional smile;
Blessing the new-born baby's first breath,
Closing the eyes that are still in death.

Taking the blame for the Doctor's mistake,
O dear! what a lot of patience it takes,
Going off duty at seven o'clock,
Tired, discouraged, just ready to drop.

But called back on special at 7:15,
With woe in her heart, but it must not be seen,
Morning and evening, noon and night,
Just doing it over and hoping it's right.

When we lay down our cap and cross the bar,
O Lord, will you give us just one little star
To wear in crowns with uniforms new
In the city above where the Head Nurse is You?

THE RED CROSS SONG.

By John R. Paddock.

Hail to the Red Cross army, white as the hosts above;
On their brows the cross of mercy, in their hearts the seal of love.
Hail to our mothers, God bless them! hail to the wives of our dead;
Hail to the hearts that are bleeding, yet marching with uplifted head,
With faces alight with the glory that comes from the gift of their best,
With hands never weary of service, with feet that are strangers to rest.
All hail to our Red Cross nurses, in hospitals, camps, with the Line,
Angels of God in their mercy, in sacrifice divine.
All hail, in the shell-torn trenches, all hail, in the flame rent air,
From the gates of heaven they are watching the flag of the Red Cross there;
And crowns for victors are falling on brows that are wet with blood,
Where the white-robed nurses stand guarding our boys on their way home to God.

Dental Dispensary at American Hospital No. 1 (France).

A corner in the Child Welfare Exhibition at St. Etienne, France, showing a group of mothers watching a demonstration by an eye, ear and throat specialist of the American Red Cross.

LETTER FROM FRANCE.

Sunday, August 19th, 1918.

Dear Doctor King:

At present I am the only dentist here, and had two convoys of fracture cases unloaded on me within a week and a half, with the result that I have been working day and night and by working in this manner, I was able to work up to my schedule today, and everything is cleaned up so that tomorrow I am ready for another convoy. Our methods for making splints are ten years behind the times, making it necessarily very slow work in splintering these cases. If I had full power to organize a Jaw department and furnished proper assistance with good laboratory men, I could take care of eighty cases a week. That probably seems like a large number, but I am sure I can do it. In England we worked under a system, and I know that if given the power to manage it, with some changes in the technic that this could be done. As it is, without any assistance, I have splinted up and treated thirty cases in the last two weeks. Some are ready to go home (to U. S.)

I feel now that practically all of the work will be done in the U. S. as you know most of the wounds with loss of bone and soft tissue will take many months to reconstruct, therefore, the reason for sending them home. Who will get this work, I do not know, but imagine some of our men in the Oral unit will be sent back to care for that kind of injuries, I have not received any orders to move as yet, and of course until the other man is sent here, don't suppose I will be moved. When the orders do come, I hope it is for the front.

I wish you could see our boys over here. Those that come back wounded are best sports alive and no mother's son can wait till he can get back to the front.

My boys are fine fellows, everyone of them, and of course that all helps, you know. All of my cases I have been able to clean up in a very short time. When we get them they are generally a very filthy lot. The reason, of course is that it is practically impossible to care for them on the way back. My treatment is very simple but find that it does the work. I feel that we must use true surgical principles in these cases only to a greater degree than in surgical cases. Removal of sepsis and immobilization of parts generally brings quicker results.

We have all been looking for Col. Logan to come over here for some time past. Now that the National Dental Association meeting is over he will no doubt be in France before winter.

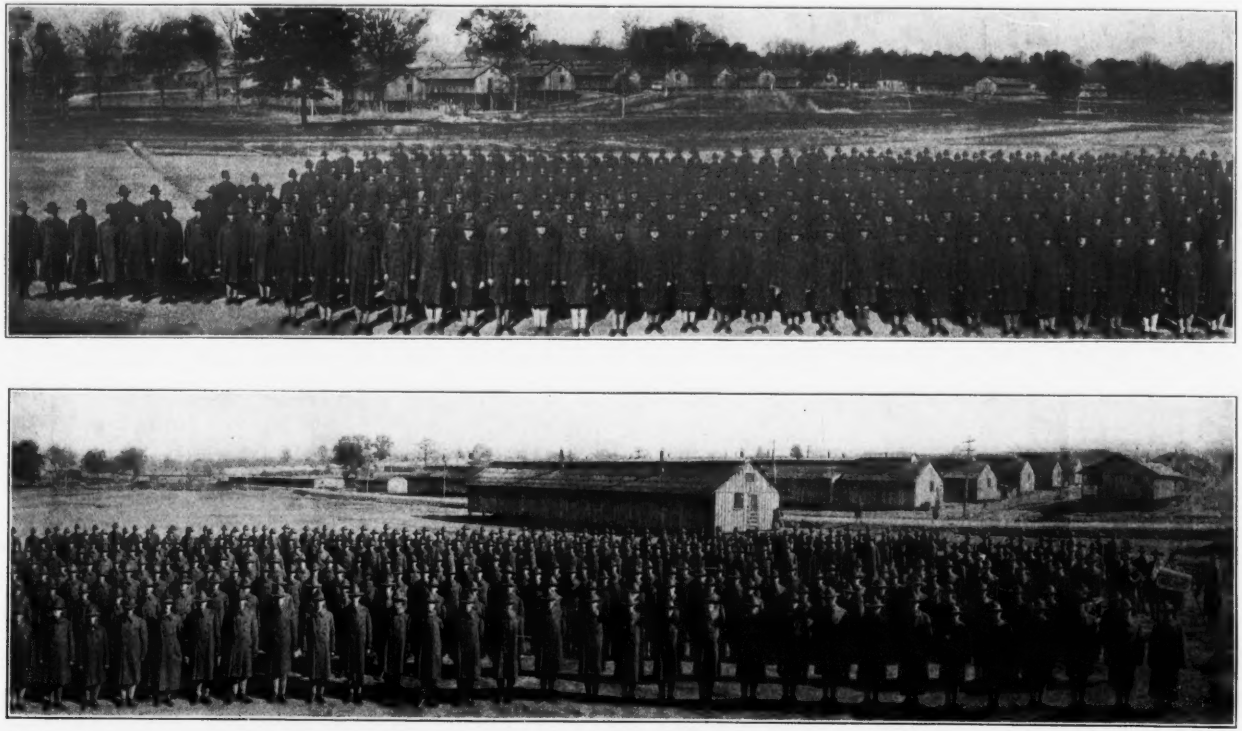
Fraternally yours,

CAPT. S.

NO MERCY.

Poetic justice is being meted out to Germany. She selected the standard of warfare by which she is to be crushed, just like the little boy who cut the switch to whip himself. Terrorism and systematic atrocity were the tools chosen by the Huns. "No mercy shall prevail!" was their watchword. And now, after years of patience on the part of her adversaries, she is experiencing the full rebound of the boomerang. True, the Allies are not stooping to the despicable methods of the Germans, such as murdering and maltreating children, women and injured soldiers. But they are, from necessity, using against the enemy some of the weapons which heretofore had been regarded as intolerable in warfare between civilized nations.

For instance, during the early period of the war there was no employment of poison gas by the Allied Forces, nor was there any bombing of unfortified towns. Now Germany's enemies have taken a leaf from the German book and are taliating with these devices in such manner as to spread terror thru the Fatherland. This terror is the greater



DENTAL CO. NO. 1, CAMP GREENLEAF, GA., NOV. 2, 1918, MAJOR GEO. R. TRESSEL, COMMANDING.

because the misguided Germans had been taught by their military leaders to believe that they were immune from any such attacks. As is always the case with cowards, the Germans are finding it difficult to swallow their own medicine. The whine that goes up from the Potsdam crew whenever it is vaguely whispered that German prisoners or interned subjects, may not be treated with courtesy and leniency is assuredly most unbecoming on the part of those who deliberately beat and crucified prisoners of war, deprived them of proper nourishment and medical attention and drove them to work in subterranean prisons. These flimsy protests, of course, deserve no attention and are treated as they deserve, as was shown the other day by the sharp reply of Secretary of State Lansing to a German threat in regard to alleged improper treatment of interned Germans in this country.

There has been much silly sentiment, to use no harsher term, displayed by pacifists in this country and England in regard to the policy of reprisals. Nay, some of them have gone to the extent of spreading the gospel of brotherly love and leniency toward the common enemy. These vapid effusions have taken the form of statements that peace with crushing defeat should not be countenanced, but that the Hun be met half way upon his first peace proposal.

The obvious fact, overlooked by these milk-and-water diplomats, is that in crushing Germany the Allies are in no way guilty of cruelty or lacking in the quality of mercy. It is purely an impersonal proposition. The jury which convicts a criminal, the judge who sentences and the sheriff who sends him to his doom are not called unmerciful. They are in no way responsible for the man's ending. They are merely the representatives of the law which prescribes certain penalties for certain crimes. That law is just and equitable and no one dares condemn the agents who carry it out.

Just so the destruction of the Prussian autocracy, with whatever attendant harshness to individuals may be entailed, must be considered as the carrying out of a legal operation. Germany committed certain heinous crimes according to the law of civilization and in the natural course of justice must pay the penalty. It falls to the part of the Entente Allies to assume the role of jury, judge and executioner. This commission will be carried out to the tragic limit, impersonally, without rancor and without a sense of cruelty, altho the rule of "No Mercy" must be a necessary part of the undertaking.—*Editorial, National Service, September issue.*

STUDENTS' ARMY TRAINING CORPS.

Organization of the work of the collegiate section of the Students' Army Training Corps under Brigadier General R. I. Rees, scheduled to begin on or after October 1, was hindered by the epidemic of influenza, which delayed some of the inductions, but it is now practically complete, and every college unit is functioning. No special difficulties, other than those arising from the epidemic, were encountered. The cooperation of the collegiate authorities has been admirable.

The following table summarizes the distribution of troops up to and including October 28 and relates chiefly to men from the vocational section, which has been in operation since last spring:

Men sent to central officers' training schools	4,421
Men sent to non-commissioned officers' schools	120
Division of military aeronautics	5,729
Chemical service	271
Coast artillery	9,220
Depot brigades	570
Engineers	7,619
Field artillery	14,303
Infantry divisions	10,442
Medical corps	3,192

Machine-gun replacements	2,373
Motor-transport corps	6,341
Ordinance	7,567
Pioneer infantry regiments (colored)	864
Quartermaster corps	8,945
Signal corps	5,626
Tank corps	2,221
Total	89,824

In the vocational section the turn-over is approximately 55,000 men each two months. It is a significant fact that among the 89,824 graduates of this section there has been not a single court-martial or an important breach of discipline.

The authorized enrollment of men in the collegiate sections is 200,000, of whom 186,400 are in the Army section, 12,000 in the Navy section, and 1,500 in the Marine section.—*Army and Navy Register, Nov. 9.*

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

DENTAL CORPS.

Appointment of 1st Lieuts. Jacob L. Brause and Clifford Strange to captains during emergency announced.

—*Army and Navy Register, Nov. 2.*

The following to Fort Oglethorpe, Ga., for instruction: Majs. Oscar G. Skelton, Emmett P. Varvel, Walter L. Reesman and Harry M. Deiber.

Appointment of following in dental corps during emergency announced:

To be Captains—1st Lieuts. Wm. S. Carrick, Ralph L. Faulkner, Charles W. Marriott and John C. Zeidled, dental corps.

—*Army and Navy Register, Nov. 9.*

Maj. Don. G. Moore to Fort Oglethorpe, Ga., for course of instruction.

Maj. Shirley W. Bowles to Anniston, Ala., Camp McClellan, for duty in base hospital 127.

Appointment of following in dental corps during emergency announced:

To be Captains—1st Lieuts. Wm. W. McCrillis, Walter F. Neuhoff, Walter J. Allison, Wm. R. Clickner, Lincoln Van Orden, Philip P. Bliss, Henry R. Allen, Wm. E. Ross, Carl F. Crecelius and Frederick H. Huff, dental corps.

—*Army and Navy Register, Nov. 16.*

Maj. Harry M. Deiber to Washington for duty in office of attending surgeon.

Maj. Wm. A. Squires, Camp Sheridan, Ala., to ninth division as division dental surgeon.

Maj. Samuel Kaufman to Alexandria, La., Camp Beauregard, for duty.

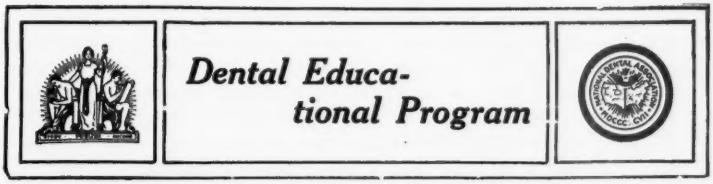
The following to Camp Upton, N. Y., for duty with base hospital 136: Majs. Peter C. Krupp and Walter H. Richardson.

Capt. B. Lucien Brun, dental corps, major, dental corps, U. S. Army, during existing emergency.

—*Army and Navy Register, Nov. 23.*

Best showing at Review to Military Surgeons, Kelly Field, Chickamauga Park, Ga., Oct. 16th, 1918. Co. 43, Batt'n 11, M. O. T. G., Lt. Wayne W. Woolley Commanding; Lt. John Richards, Batt'n Commander. W. N. Bispham, Col. M. C., U. S. A.

Join the Red Cross



COMMITTEE ON EDUCATION AND SPECIAL TRAINING.

War Department, Washington,
November 8, 1918.

Dr. Otto U. King,
Unity Building,
Chicago, Illinois.

Dear Dr. King:

I enclose herewith copy of Bulletin C. b. 35, issued by the Committee on Education. You will notice by paragraph 5, that the courses for the present Senior, Junior and Sophomore classes as arranged by the respective schools are to remain undisturbed, except for such changes as may be necessary to meet the military requirements, and to permit of three examinations between now and June 21, 1919, the end of the third term.

Paragraph 6, prescribes the subjects for the freshmen course, but permits considerable leaway in the adjustment of the hours, also as to the term in which the prescribed subjects will be given.

This whole arrangement has been made with two objects in view; to disturb as little as possible the schedules arranged for the upper classes this year, and to start the present freshman classes in all schools on a practically uniform schedule.

There will be issued within a few days another bulletin which will suggest the full four year schedule for the present freshman class, arranged in twelve terms. This schedule has been made up after a careful study of the schedule of all schools, and the effort has been made to prepare a schedule which would meet the views of the large majority.

The opportunity is hereby presented, regardless of whether or not the Committee on Education maintains control, of placing all dental schools on a uniform schedule, at the same time giving each school considerable leaway in the arrangement of its hours. There are many advantages to be gained if this plan can be carried out, and it is hoped that all schools will be willing to make whatever changes may be necessary for the general advancement of dental education.

Very truly yours,

COMMITTEE ON E. AND S. T.
Arthur D. Black.

(Advance copy.) C. b. 35.

WAR DEPARTMENT.

Committee on Education and Special Training.

Special Bulletin on Information and Program for Dental Schools.

1. The terms should be arranged in all schools on a quarterly basis, in each term twelve weeks being devoted to instruction and examinations.

2. Members of the Students Army Training Corps will be under military discipline continuously and will live in barracks as prescribed by military authorities. A definite schedule of work must be arranged, eleven hours per week

being devoted to military instruction; and forty-two hours to the War Issues course and professional instruction, this time including lectures, recitations and supervised study. In the case of students who have pursued for at least one year at an approved institution such studies as form part of the program of preparation for the Dental Corps, the Committee on Education and Special Training may authorize a reduction in the hours of military instruction to not less than six hours, provided the reduction is made good by the substitution of a corresponding number of hours in approved dental subjects.

3. Dental Schools are classified as professional schools under the Special Regulations for the Students Army Training Corps (Aa. 1, Par. 26).

4. A special War Issues course is prescribed for all students who are not excused under the following provisions of par. 26, Special Regulations:

"The District Education Director (Section A—Collegiate Section) may empower colleges to excuse from this course: (1) Members of the S. A. T. C. who have had a similar course even tho not identical in every detail, or (2) Members of the S. A. T. C. who have already had at least two years of work of collegiate grade in an approved institution and who should be required to concentrate the whole of their time on advanced studies."

The War Issues Course is described in Special Circulars C.e. 12 and C.e. 13. The modification of this course for Dental Schools requires that it shall occupy six months (two terms) instead of nine months (three terms). For the freshman class the course should be combined with English Composition. There should not be more than one lecture per week, with one hour for class discussion, and one hour for the discussion of written work on the subject of the course, considered both for its form and content, and six hours devoted to study. For other classes, this course must consist of a minimum of three class-room hours per week, with corresponding study hours, for six months.

5. The program of studies for the senior, junior and sophomore classes in dental schools will for the present conform to the schedules previously arranged by the respective schools, with such modification as may be necessary to meet the military program, and to permit of examinations being held at the close of each of the three terms between now and June 22, 1919. The weekly program for these classes will consist of six hours of military instruction, nine hours devoted to the War Issues Course, and thirty-eight hours devoted to professional courses.

6. The weekly program for the freshman class must include Military Instruction 11 hours in each term, War Issues and English 9 hours in the first and second terms. For the professional schedule for this class the following subjects are prescribed and the approximate distribution of hours is indicated: First term, October 1 to December 21; Biology 12 hours, Chemistry 12 hours, Dental Anatomy 9 hours. Second term, December 30 to March 22; Chemistry 12 hours, Anatomy (arm or leg, thorax and abdomen, including dissection) 11 hours, Prosthetic Technic 10 hours. Third term, March 30 to June 22; Histology (general) 12 hours, Operative Technic 10 hours, Prosthetic Technic 11 hours, English 9 hours. It is understood that the hours stated above represent in each case the time over all including class-room, laboratory and study.

7. Some variation as to the term during which specified courses are given will be permitted in cases in which any of the above courses not prescribed for the first term may already be too far advanced to justify a change, or in cases in which the physical equipment of the school, or the burden placed on certain teachers by the plan of intensifying the courses, will make it more practicable to give a course to half of the class in

one term and half in another. For example, the laboratory course in anatomy may be given to one-half of the class in the second term and to the other half in the third term. In this case, the course in histology or that in operative technic would necessarily be similarly divided. All of the prescribed courses must be completed during the current school year.

8. The courses in Physics and Technical drawing scheduled by many dental schools for the freshman year are omitted. These may be included in the Sophomore program of this class.

COMMITTEE ON EDUCATION
AND SPECIAL TRAINING,
By R. C. MACLAURIN,
Educational Director, Collegiate Section.
October 15, 1918.

(Advance Copy) C.b.35.a.

WAR DEPARTMENT.

Committee on Education and Special Training.

Special Bulletin on Program in Dentistry.

The program here presented is not prescribed, but is an example of what will be approved. It is an arrangement of the dental program in twelve terms, with a proper allowance of time for military instruction and for the War Issues course. This schedule is planned to be followed by the present freshman class and is not intended for the other classes during the present school year. However, it may serve as an aid in arranging the schedules of these classes on the term basis. The program for senior, junior and sophomore classes for the current year must comply with par. 5, Bulletin C.b.35.

Each term will consist of twelve weeks, inclusive of time for examinations.

The sequence of subjects has been carefully studied in the preparation of this program. For what may be termed the basic studies, the arrangement is as follows: Biology, Inorganic Chemistry, Anatomy (arm or leg, thorax and abdomen), Histology (general), Physics, Organic Chemistry, Metallurgy, Anatomy (head and neck), Physiology, Physiological Chemistry, Bacteriology, Materia Medica, Pharmacology, Pathology (general), Surgery, Anesthesia.

The dental subjects present in the following order: Dental Anatomy, Technical Drawing, Prosthetic Technic, Operative Technic, Dental Histology, Operative Dentistry, Prosthetic Dentistry, Dental Pathology, Radiography, Orthodontia, Oral Surgery, Dental Ethics, Dental Jurisprudence, Dental Economics.

In the tenth, eleventh and twelfth terms, two class hours have been assigned to each of the following subjects: Operative Denistry, Prosthetic Dentistry, Dental Pathology, and Oral Surgery. It is suggested that one hour for each shall be devoted to seminar work, the class being divided into small sections.

It is expected that the subjects mentioned for each group of three terms will be given within that particular nine months, altho there may be reasonable variation as to the term in which the specified subjects are scheduled in cases where the physical equipment of the school, or the burden placed on certain teachers by the plan of intensifying the courses, justifies the change. It may often be advantageous to give a particular course to half of a class in one term and half in another. Each school may work out the schedule to which it may best adapt itself, so long as the subjects of each group of three terms are complete within the three-term period.

COMMITTEE ON EDUCATION AND SPECIAL TRAINING.

Suggestive Course for Dental Schools arranged by terms, each term, including examinations, to occupy 12 weeks:

First term	Hours per week		
	Total	Class	Lab.
Biology	12	3	7
Inorganic Chemistry	12	3	6
Dental Anatomy	9	1	7

	Total	Class	Lab.
War Issues and English	9	3	..
Drill	11	..	..
Totals	53	10	20

Allowance for Study, 12 hours.

Second term:

Inorganic Chemistry	12	3	6
Anatomy (arm or leg, thorax, abdomen)	11	2	8
Prosthetic Technic	10	1	8
War Issues and English	9	3	..
Drill	11	..	..
Totals	53	9	22

Allowance for Study, 11 hours.

Third term:

Histology, general	12	3	7
Operative Technic	10	2	6
Prosthetic Technic	8	1	6
Technical Drawing	3	..	3
English	9	3	..
Drill	11	..	..
Totals	53	9	22

Allowance for Study, 11 hours.

Fourth term:

Organic Chemistry and Metallurgy	12	3	7
Physics	12	2	7
Comparative Dental Anatomy	2	1	..
Operative Technic	11	2	6
Prosthetic Technic	10	2	6
Drill	6	..	..
Totals	53	10	26

Allowance for Study, 11 hours.

Fifth term:

Anatomy (head and neck)	10	2	6
Physiology	7	2	3
Physiological Chemistry	8	2	4
Dental Histology and Embryology	7	2	3
Operative Technic	7	2	3
Prosthetic Technic	8	1	6
Drill	6	..	..
Total	53	11	25

Allowance for Study, 11 hours.

Sixth term:

Anatomy (head and neck)	10	2	6
Physiology	9	3	3
Bacteriology	11	3	6
Operative Technic	3	1	..
Prosthetic Technic	9	1	6
Clinic	5	..	5
Drill	6	..	..
Totals	53	10	26

Allowance for Study, 11 hours.

Seventh term:

	Hours per week		
	Total	Class	Lab.
Physiology (nervous system)	6	3	..
Materia Medica and Pharmacology	8	2	4
Pathology	4	2	..
Operative Dentistry	5	2	..
Prosthetic Dentistry	12	1	9
Clinic	12	..	12
Drill	6	..	..
Totals	53	10	25

Allowance for Study, 12 hours.

Eighth term:

Pathology	8	2	4
Dental Pathology	3	1	..
Surgery	3	1	..
Oral Hygiene	3	2	..
Operative Dentistry	5	2	..
Prosthetic Dentistry	9	1	6
Clinic	16	..	16
Drill	6	..	..
Totals	53	9	26

Allowance for Study, 12 hours.

Ninth term:

Physical diagnosis	3	1	1
Anesthesia	2	1	..
Radiography	2	1	..
Dental Pathology	6	1	3
Orthodontia	4	1	2
Operative Dentistry	5	2	..
Prosthetic Dentistry	5	2	..
Clinic	20	..	20
Drill	6	..	..
Totals	53	9	26

Allowance for Study, 12 hours.

Tenth term:

Dental Pathology	5	2	..
Oral Surgery	7	2	2
Orthodontia	3	1	..
Operative Dentistry	5	2	..
Prosthetic Dentistry	5	2	..
Clinic	22	..	22
Drill	6	..	..
Totals	53	9	24

Allowance for Study, 14 hours.

Eleventh term:

Dental Pathology	5	2	..
Oral Surgery	7	2	2
Orthodontia	2	1	..
Operative Dentistry	5	2	..
Prosthetic Dentistry	5	2	..
Dental Ethics and Jurisprudence	2	1	..
Clinic	21	..	21
Drill	6	..	..
Totals	53	10	23

Allowance for Study, 14 hours.

Twelfth term:

	Hours per week		
	Total	Class	Lab.
Dental Pathology	5	2	..
Oral Surgery	7	2	2
Orthodontia	2	1	..
Operative Dentistry	5	2	..
Prosthetic Dentistry	5	2	..
Dental Economics	2	1	..
Clinic	21	..	21
Drill	6	..	..
Totals	53	10	23

Allowance for Study, 14 hours.

In the tables the first column of figures represents the time over all for each subject, including lecture, recitation, laboratory and study hours; the second column the number of hours for class work (lecture or recitation), and the third column the number of hours for laboratory exercises. It should be clearly understood that the hours in the tables are not prescribed, but are only suggested as a fair division of the time for the various subjects in the course.

The subjects for the first three terms were prescribed in Bulletin C.b.35. It will be noted that Technical Drawing has been included in the third term. A part of the time assigned to Anatomy in the second term might be devoted to comparative vertebrate anatomy, to supplement the course in Biology.

Note: The above division of time is equivalent to the requirements of the Dental Educational Council of America.

SUMMARY OF HOURS FOR CLASS AND LABORATORY EXERCISES.

The division of time suggested will give the total number of hours for class and for laboratory exercises in each subject, also the total hours devoted to each subject, by groups of three terms each, as follows:

First, Second and Third Terms:

	Class	Lab.	Total
Biology	36	84	120
Inorganic Chemistry	72	144	216
Anatomy (arm or leg, thorax, abdomen)	24	96	120
Histology (general)	36	84	120
Dental Anatomy	12	84	96
Operative Technic	24	72	96
Prosthetic Technic	24	168	192
Technical Drawing	..	36	36
War Issues and English	108	..	108
	336	768	1104
Study			408
Drill			396
			1908

Fourth, Fifth and Sixth Terms:

	Class	Lab.	Total
Organic Chemistry and Metallurgy	36	84	120
Physiological Chemistry	24	48	72
Physics	24	84	108
Anatomy (head and neck)	48	144	192
Physiology (general)	60	72	132
Bacteriology	36	72	108
Comp. Dental Anatomy	12	..	12
Histology (dental) and Embryology	24	36	60
Operative Technics	60	108	168
Prosthetic Technics	48	216	264
Clinic	..	60	60
	372	924	1296
Study			396
Drill			216
			1908

Seventh, Eighth and Ninth Terms:

	Class	Lab.	Total
Physiology (nervous system)	36	..	36
Materia Medica and Pharmacology	24	48	72
Pathology	48	48	96
Physical Diagnosis	12	12	24
Surgery	12	..	12
Anesthesia	12	..	12
Radiography	12	..	12
Dental Pathology	24	36	60
Operative Dentistry	72	..	72
Prosthetic Dentistry	48	..	48
Prosthetic Technic	..	180	180
Orthodontia	12	24	36
Oral Hygiene	24	..	24
Clinic	..	576	576
	336	924	1260
Study			432
Drill			216
			1908

Tenth, Eleventh and Twelfth Terms:

	Class	Lab.	Total
Dental Pathology	72	..	72
Operative Dentistry	72	..	72
Prosthetic Dentistry	72	..	72
Oral Surgery	72	72	144
Orthodontia	36	..	36
Dental Ethics and Jurisprudence	12	..	12
Dental Economics	12	..	12
Clinic	..	768	768
	348	840	1188
Study			504
Drill			216
			1908

SUGGESTIONS RELATIVE TO THE ARRANGEMENT OF WEEKLY TIME SCHEDULES.

If the weekly time table is so arranged that there is a study hour from 7:30 to 9:45 in the evening, this provides 11¼

evening study hours each week, omitting Saturday and Sunday evenings. If this is counted as 11 hours, there remain 42 hours per week for daytime schedule.

For the freshman class the following daily program is suggested: School 8 to 12:30 and 1:30 to 2:30; Drill 3 to 5; Recreation until Retreat. Saturday: Inspection 8 to 9; School 9 to 12:30. This provides 11 hours for military instruction and 31 hours for class, laboratory and study, in addition to the evening study hours.

For the sophomore, junior and senior classes, two daily programs are suggested: (1) School 8 to 12:30 and 1:30 to 3:30; Drill 4 to 5; Recreation until Retreat. Saturday: Inspection 8 to 9; School 9 to 12:30. (2) Tuesday and Thursday: School 8 to 12:30 and 1:30 to 3; Drill 3 to 5; Recreation until Retreat. Monday and Friday: School 8 to 12:30 and 1:30 to 4; Recreation until Retreat. Wednesday: Military Instruction 8 to 9; School 9 to 12:30 and 1:30 to 4:30; Recreation until Retreat. Saturday: Inspection 8 to 9; School 9 to 12:30. Either plan provides 6 hours for military instruction and 36 hours for class, laboratory and study, in addition to the evening study hours.

The drill hours might be placed in the early morning and similar schedules worked out, with additional school hours in the afternoon.

These programs are only suggestive. It is expected that the Commanding Officer and the Dean will cooperate in making the most satisfactory arrangement. Owing to the highly technical nature of the work of the dental student, it is important that the schedule shall give the best possible light during school hours.

COMMITTEE ON EDUCATION
AND SPECIAL TRAINING,
By R. C. Maclaurin,
Educational Director, Collegiate Section.

Notice—Tomorrow; today will be yesterday. Send your Relief Fund Christmas Fund check today.

NATIONAL SOCIETIES.

National Dental Association, October, 20-24, 1919, New Orleans.

National Association of Dental Faculties, New Orleans, October 20-24, 1919.

National Association of Dental Examiners, New Orleans, October 20-24, 1919.

Xi Psi Phi Fraternity, New Orleans, October 20-24, 1919.

Association of Military Dental Surgeons, New Orleans, October 20-24, 1919.

Delta Sigma Delta, New Orleans, October 20, 1919.

STATE SOCIETIES.

January.

Alaska, January 13, Cordova.

Hawaiian Islands, January 10, Honolulu.

February.

Minnesota, Feb. 6-7-8, Minneapolis.

March.

Vermont, March 19-20-21. Place to be announced.

April.

Alabama, April 7-8-9-10-11, Birmingham.

Connecticut, April 15-16-17, Hartford.

Michigan, April 7-8-9-10-11-12, Detroit.

Missouri, April 14-15-16, St. Louis.

Pennsylvania, April 29-30-May 1, Pittsburgh.

Texas, April, Waco.

West Virginia, April 9-10-11, Wheeling.

Kansas, April 14-15-16, Topeka.

May.

Arkansas, May 19, Pine Bluff.

California Southern, May, Los Angeles.

Illinois, May 13-14-15-16, Peoria.

Indiana, May 20-21-22-23, Indianapolis.

Iowa, May, 6-7-8, Des Moines.

Massachusetts, May 7-8-9, Boston.

Nebraska, May 20-21-22, Omaha.

North Dakota, May, Fargo.

South Dakota, May, Mitchell.

June.

Colorado, June, 19-20-21.

Florida, June 18-19-20, Tampa.

Georgia, June 11-12-13, Savannah.

Kentucky, June 9, 10, 11, 12, Louisville.

Maine, June. Place to be announced.

Maryland, June, 1919, Baltimore.

New Hampshire, June 18-19-20, Manchester.

New York, June 12-13, Syracuse.

South Carolina, June, Columbia.

Utah, June, Ogden.

July.

Montana, July 24-25-26, Butte.

New Jersey, July. Place to be announced.

Wisconsin, July 8-9-10, Milwaukee.

October.

Louisiana, October 21, New Orleans.

Rhode Island, October, Providence.

December.

Ohio, December 2-3-4, 1919.

DATES TO BE ANNOUNCED.

Arizona, Phoenix.

California State, San Francisco.

Minnesota, Minneapolis.

Mississippi, Clarksdale.

New Mexico, Albuquerque.

North Carolina, Asheville.

Oklahoma.

Tennessee, Nashville.

Virginia, Richmond.

Washington, Seattle.

BACK COPIES OF 1918 JOURNAL.

Several of the medical and dental libraries need extra copies of the 1918 Journal. This volume will be bound and placed on the shelves of the library for reference work. Therefore, if our readers who do not intend to bind this volume will send it to us, by express, collect, we will appreciate it.

DR. OTTO U. KING, Sec'y,
National Dental Association,
127 No. Dearborn St., Chicago, Ill.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the North Carolina State Board of Dental Examiners will be held at Raleigh, N. C., beginning promptly at 9 o'clock on Thursday morning, January 9th, 1919. For further information and application blanks address F. L. HUNT, Sec'y,
Asheville, N. C.

OHIO STATE DENTAL SOCIETY.

Columbus, Ohio, Nov. 5, 1918.

Dr. Otto U. King, Chicago.

Dear Dr. King:—Inclosed is a copy of letter sent to Dean of each Dental College in the United States. It shows the stand our State Society has taken relative to the Colleges, our State Board and Dental Educational matters in general.

I may add, we are getting pledges of hearty co-operation from Colleges.

Fraternally,
EDWARD C. MILLS.

Columbus, Ohio, Oct. 24, 1918.

At the December, 1917, meeting of the Ohio State Dental Society, the following resolution was adopted:

Resolved: That an Advisory Dental Educational Committee of three be appointed by the President of the Ohio State Dental Society whose duty it shall be to establish a closer relationship between the dental profession-at-large and the Ohio State Board of Dental Examiners for the purpose of investigating the curricula of the dental colleges to the end that they comply with the specified requirements of Section 1322 of Ohio State Dental law, and be it further

Resolved: That the personnel of the above committee be limited to members of the State society who have no college affiliations.

Section 1322. An applicant for license to practice dentistry shall appear before the State Dental Board at its first meeting after filing his application and pass a satisfactory examination consisting of practical demonstrations and written or oral tests, or both, in the following subjects: Anatomy, physiology, chemistry, material medica, therapeutics, metallurgy, histology, pathology, bacteriology, prosthetics, operative dentistry, oral surgery, anesthetics, orthodontia, and oral hygiene.

The object of this committee is to bring the State Society into a closer relation and understanding with dental educational matters and co-operation with the National Dental Educational Council of America; its purpose further is to bring about a better understanding between the colleges and the State Board relative to Section 1321-1 of the Ohio Dental Law. (Dental Summary, June 1915, Vol. 35, p 511) touching on the credentials as evidence of satisfactory preliminary education of an applicant for license in Ohio.

We call your attention to the reports of the National Association of dental examiners for the past few years as evidence that the colleges having the smallest per cent of failures are institutions which insist upon preliminary requirements as called for in the above mentioned sections.

As the dental schools regulate the standards of the dental profession, the classification recently published by the Dental Educational Council is timely and the requirements in schools rated "A" measure up to our board's definition of

a reputable dental college. (Dental Summary April 1915, Vol. 35, p. 333) and are only what would be expected of any college making a pretense of qualifying a student for practice.

Personal inspection of many examination papers convince us of the necessity of a closer understanding between the colleges and the State Board as to specific acquirements and training.

With the students interests our paramount motive, we are

Yours respectfully,

EDWARD C. MILLS, Chairman.
H. C. MATLACK, Cincinnati.
GUY D. LOVETT, Cleveland.
EDWARD C. MILLS, Columbus.

AMERICAN RED CROSS DENTAL AMBULANCES.

And now they are utilizing dental ambulances in France, that American soldiers may have healthy mouths, with consequent good digestion and health. The first two of these dental ambulances on record were equipped thru the efforts of Mrs. William Boyce Thompson and given thru the American Red Cross to the Dental Department of the United States Army.

These ambulances have all the appurtenances of the modern dental office, with the added advantage of being able to visit the patient in all sorts of out-of-the-way places. They consist of a main operating room and two good-sized tents. Every contrivance approved by the dental profession is installed in the ambulance.

In the center room, or office proper, is a complete dental outfit, with separate bracket for instruments, electric engine, fountain cuspidor, pressure tank with syringe and sprays, hot and cold water faucets, steam sterilizer, filter, vulcanizer, electric lathe, blow pipe, nitrous oxide and oxygen gas apparatus, sanitary cabinet for instruments, a full set of forceps and duplicate sets of instruments. There is even a typewriter for office record use.

The car is lighted by electricity generated by batteries especially built for the ambulance. Should they fail, provision is made for acetylene gas lighting.

When the car is in transit a field outfit, which closes up in three containers, is stored in the office. This is set up as soon as the car is ready for service. On either side of the office is a tent, one used for the field outfit; the other is converted into sleeping quarters or it may be used as an adjunct operating room.

While dental treatment is being given in the office, one of the tents may be used for the more difficult operations. The car is manned by a crew of two officers, two dental assistants and a chauffeur. In hot weather the sides of the tent may be rolled up, insuring all possible ventilation.

One of these ambulances is in active service at Camp Upton, the other at Camp Greenleaf. In all camps, newly arrived draftees carry with them trifling ailments—measles, mumps, and the like. The men are quarantined and as they cannot go to the dentist, the dental office honks up to them.

Camp Meade also has a dental ambulance, the gift of the Cleveland Unit of the Preparedness League. The Connecticut Unit provided funds for another which is going to France to serve our boys at the front. The Red Cross has thirteen of the dental ambulances, either completed or in process of construction. Three of them are for service in France and the other ten (three dental ambulances and seven baby saving trucks) are on their way to Italy. All thirteen will go "over there." The Red Cross considers that the work among the babies and children of the war-swept lands will do much to rehabilitate future generations.

In order to continue this work and to provide for the greatly increased number of men who are being sent overseas monthly, the Red Cross will need the united support of the American people,

that its mission of mercy and humanity may not be halted. For that reason the Red Cross will hold its second annual Christmas roll call during the week of December 16th to 23rd, when it is hoped every American man, woman and child will place his or her name on the Red Cross roster. Last year 22,000,000 adults and 8,000,000 children responded to the call and took a nation-wide pledge to stand squarely behind the Flag in our war for justice and liberty for all.

The above paragraphs, under the heading, "American Red Cross Dental Ambulances" is matter which has been received direct from the Publicity Bureau of the Eastern Department of the Red Cross. It is therefore authentic. All League officers are requested to have this published in their local newspapers during the next Red Cross Drive, which will begin December 16th.

R. OTTOLENGUI,
Director of Publicity.

RECENT PATENTS RELATING TO DENTISTRY.

1277601, Emery-cloth file, Albert Katzke, Milwaukie, Oregon.

1278066, Dental tool, Vincent J. Luongo, Brooklyn, N. Y.

1278010, X-ray protective cement, Paul Poetschke, Milford, Del.

1278415, Artificial tooth, Wm. W. Atkinson, Clementon, N. J.

1278124, Tooth-crown holder, Joseph H. Elliott, Rockford, Ill.

1278153, Dental mixing slab, Samuel L. Jefferies, Gaffney, S. C.

1278744, Alloy and purifying same, Paul Poetschke, Milford, Del.

1278225, Tooth and mouth cleanser, Morris I. Schamberg, New York, N. Y.

1278789, Toothbrush sterilizer and retainer, Samuel H. Thompson, Los Angeles, Cal.

1278806, Collapsible container, Wm. M. Wheildon, Ashland, Mass.

52385, Design, Tooth-brush, Elizabeth B. Clapp, Boston, Mass.

52388-90, Design, Tooth-brush handle, Wm. F. Graul, Northampton, Mass.

1279290, Tube for paste, etc., John F. De Camps, Danville, Ill.

1279120, Electrotherapeutical chair, John H. Kellogg, Battle Creek, Mich.

1279026, Dental floss holder and manipulator, Ernst Sievers, New York, N. Y.

1279507, Tooth-brush, Clare Briggs, Battle Creek, Mich.

1279664, Dental-cement-injecting tube, Henry L. Cruttenden, Northfield, Minn.

1279996, Rotary tooth-brush, Clifton L. Dorland, Stratford, Canada.

1279695, Paste-tube, Frank J. Hollis, Canandaigua, N. Y.

1279549, Anesthetic-administering apparatus, W. A. Johnston, A. W. Browne, Prince Bay, N. Y., and F. L. Wallace, Philadelphia, Pa.

1279942, Analgesic body and making, Lambert Thorp, Cincinnati, Ohio.

1279805, Anchoring means for artificial teeth, Nelson B. Whitaker, Providence, R. I.

Copies of above patents may be obtained for fifteen cents each, by addressing John A. Saul, Solicitor of Patents, Fendall Building, Washington, D. C.

Book Review.

Mammalian Dentition, by T. Wingate Todd, M. B., Ch. B., Manc.; F. R. C. S., Eng., Captain, Canadian Army Medical Corps. Henry Wilson Payne, Professor of Anatomy in the Western Reserve University, Cleveland, Ohio; formerly lecturer in Anatomy, Victoria University of Manchester, England. Cloth. Price $3.00; pp. 290 with 100 illustrations. St. Louis C. V. Mosby, 1918.

Practical Dental Metallurgy, a text and reference book for students and practitioners of dentistry embodying the principles of Metallurgy, and their application to dentistry, including experiments. By Joseph Depuy Hodgen, D. D. S., Professor of Operative Dentistry (formerly

Professor of Dental Chemistry and Metallurgy), College of Dentistry, University of California; Revised by Guy S. Milberry, D. D. S., Professor of Chemistry and Metallurgy and Dean of the College of Dentistry, University of California. Fifth edition, completely revised. Cloth. Price $2.50; pp. 436 with 61 illustrations. St. Louis, C. V. Mosby Company, 1918.

Roentgen Diagnosis of Diseases of the Head, by Dr. Arthur Schuller, Head of the Clinic for nervous diseases at the Franz-Joseph Ambulatorium, Vienna. Authorized translation by Fred F. Stocking, M. D., M. R. C., with a foreword by Ernest Sachs, M. D., Associate Professor of Surgery in Washington University. Approved for publication by the Surgeon General of the United States Army. Cloth. Price $4.00; pp. 305 with 97 illustrations. St. Louis, C. V. Mosby Company, 1918.

In Memoriam.

Lieutenant Commander Arthur A. Rehm, Dental Surgeon United States Navy. Died October 20, 1918.

Lieutenant Commander Rehm was born in Meriden, Conn., on October 16. 1886. He was educated in the public schools of Meriden and by private tutor, graduated from the Baltimore Dental College with honors in June, 1913. He passed his examination for dental surgeon and was commissioned Lieutenant Junior Grade February 13, 1914, with instructions to proceed to Norfolk Navy Yard. After several months he was ordered to the U. S. S. Dixie aboard of which he served for several cruises to the West Indies. He also served for one cruise aboard the U. S. S. Seattle, and when the U. S. S. Melville was made Mother ship to the torpedo boats and flag ship for Admiral Sims, Dr. Rehm was ordered to the Melville as Dental Surgeon. At the entrance of United States into the war, he was ordered overseas with the first squadron of torpedo boats and was the only Dental Surgeon for some time at Queenstown. After serving for a year and three months he was ordered home to organize the bureau of dental supplies and take his examinations for Lieutenant Commander. While in Washington on business he was stricken with pneumonia and died at the Marine Hospital after a few days' illness.

LIEUTENANT COMMANDER ARTHUR A. REHM,
Dental Surgeon U. S. N.

He was buried at his birth place with full naval honors due his rank. He was an honor to his country and to his profession, a most modest man and to those who were fortunate to know him, he was most beloved.

KOLYNOS

AND

INFLUENZA

Protection from Infection is better than cure.

The Infection of Influenza is disseminated through the sputum, scattered by sneezing, or borne upon the exhalations of the breath. But no dentist need acquire this infection from, or transmit it to, his Patient.

The intelligent use of Kolynos Dental Cream and Kolynos Liquid keeps the mouth, the throat and the air passages in a truly sanitary condition, in which infectious germs do not thrive.

During the hours of practice, frequently spray your own mouth, throat and nostrils with Kolynos Liquid, in such dilution as is agreeable, and do the same with your patient before and after treatment.

The germicidal power of undiluted Liquid Kolunos is equal to a solution of 30% of Carbolic Acid; even in full strength, however, it will not injure the most delicate tissue.

Neither in the epidemic of 1916, nor in the present epidemic, has there been a single case of Influenza among the large number of operatives employed in our laboratories. This immunity we attribute to the antiseptic properties of the volatile ingredients entering into the composition of Kolynos Dental Cream and Kolynos Liquid, with which the air of our factory is permeated.

THE KOLYNOS COMPANY

NEW HAVEN, CONN.

The Packages

1. The Formula
2. The Annealing
3. Filings Only
4. The Packages
5. The Maker
6. $1.50 per oz.

WHETHER an alloy is put up in cut-glass bottles, sealed in elaborate cartons, or in a simple, sufficient container, does not affect the character of the material. It *does* affect the price.

And it does make a difference whether an alloy is sold in a 1-oz. bottle or a 5-oz. bottle.

A 5-oz. bottle may last a dentist many months, and the repeated opening, exposing the alloy to air and dust, results in oxidation and contamination.

It is for this reason that the last quarter of a 5-oz. bottle frequently presents difficulties of amalgamation.

NEY-ALOY

Is Put Up in 1-oz. Bottles Only

In shipment, five bottles are placed in a package. This means that the dentist opens a fresh bottle for every ounce.

Carton, 5 single ounces, $7.00

If our products are not promptly and cheerfully supplied by your dealer write to us

THE PIONEER

THE LATE JOHN M. NEY

MANUFACTURED BY

The J. M. NEY COMPANY

FOUNDED IN 1812

J. M. Ney, President

HARTFORD, CONNECTICUT, U.S.A.

NEW GOLD FOR OLD GOLD SILVER PLATINUM ETC.

All Dentists May Not Know That

COREGA

On a Cotton Roll Will Check Excessive Flow of Saliva

Will hold trial plates in position

Will teach patients to wear their dentures with comfort

Will prevent sore gums

COREGA is an antiseptic and strongly adhesive powder. It contains no tragacanth and is far superior to any preparations which do.

Sold by Dental Supply Dealers and at Drug Stores

35c, 70c and $1.40 size in U. S. A.

The $1.40 size contains five and one-half times the quantity of 35c size

Manufactured only by

COREGA CHEMICAL CO.

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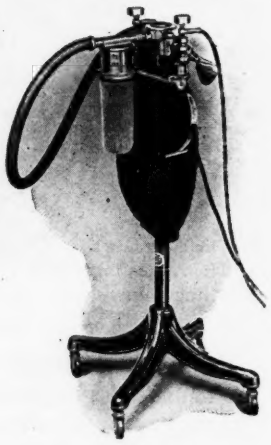
AUTOMATIC



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Write for Catalog, Etc.

TOLEDO TECHNICAL APPLIANCE CO.

TOLEDO, OHIO

In the treatment of suppurative lesions of the gums, wherein stimulating restorative antiseptic influence is indicated, prescribe

LISTERINE

For cleansing and purifying the oral cavity before and after operations on the teeth, a cooling, refreshing spray, wash or gargle is provided by

LISTERINE

As an adjunct to the dental toilet of your patients; as a prophylactic tooth and mouth wash, for daily use, there is nothing superior to

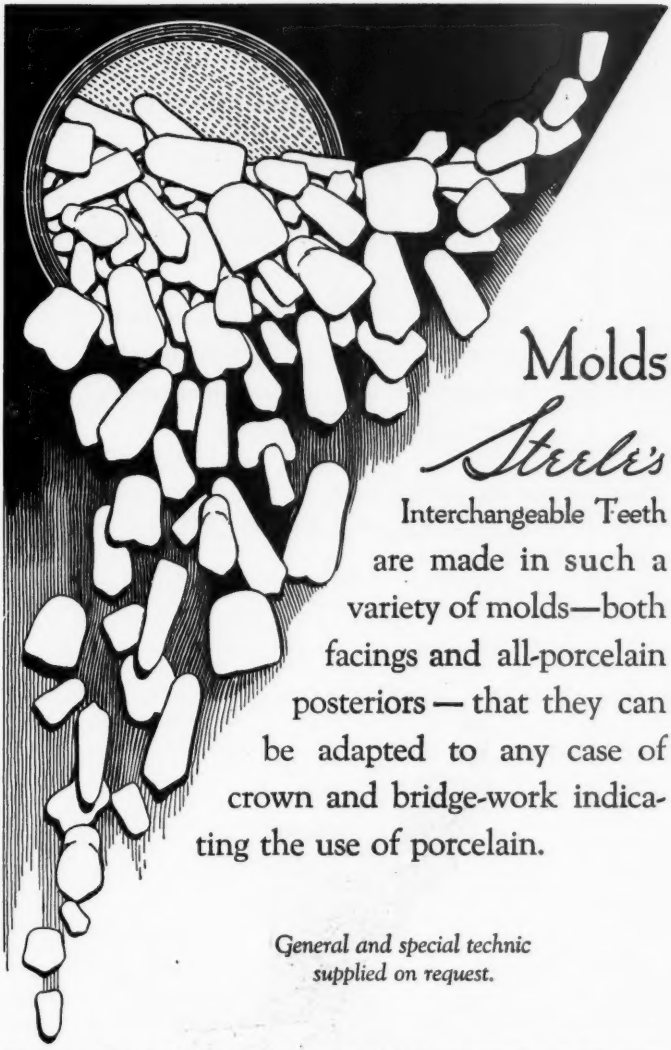
LISTERINE

Booklet "The Teeth and Their Care" emphasizes the importance of frequent consultation with the dentist, and contains useful information for patients; 200 copies, imprinted with professional card, furnished gratuitously.

Dental examination blank combining chart and Notice to Parents, suitable for dentists doing clinical work among school children, also supplied without cost. Dentist's name and address printed thereon.

Lambert Pharmacal Company

Twenty-first and Locust Streets — St. Louis, Mo., U. S. A.



Molds

Steele's

Interchangeable Teeth are made in such a variety of molds—both facings and all-porcelain posteriors — that they can be adapted to any case of crown and bridge-work indicating the use of porcelain.

General and special technic supplied on request.

THE COLUMBUS DENTAL MANUFACTURING CO.

COLUMBUS, OHIO, U. S. A.

AN EXCLUSIVE FEATURE

**

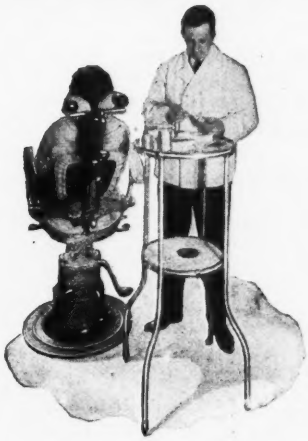
The Self-conforming Back

The back of the Ritter chair is designed to conform to the body when reclined so that no re-adjustment of the headrest is necessary.

The Ritter Dental Mfg. Co.

of Rochester, N. Y.

Before Adjusting the Rubber Dam



Even with the help of an assistant, it is a difficult and time-consuming operation to adjust the rubber dam for cavities that extend far under the gum, especially when a hypertrophied condition of the gum has been caused by saw-like enamel edges.

If a filling of Calxine, a temporary cement, is inserted in the cavity, the dam may be adjusted and ligated very quickly. After the dam is in place, the Calxine is easily removed, as it has a light, chalky consistency due to the fact that it is mixed thin.

Calxine
A TEMPORARY CEMENT

Single-portion packages $1.25

Six-portion packages $6 00

Calxine is made in the laboratories of

THE CLEVELAND DENTAL MFG. CO.

Standard Forceps, Elevators And Extracting Accessories

CLEV-DENT

Crandall's Scientifically Tested Non-Zinc Alloy

CLEVELAND, OHIO, U. S. A.

Clev-Dent Hand Operating Instruments

Matrix Bars **Calxine** **Vyvex** **Matrix Bands**

What You Should Know About Pepsodent

It is based on Pepsin, the digestant of albumin.

Its distinction lies in the patented method of activating pepsin which is harmless to enamel.

Its object is to combat the mucin plaque, and to constantly prevent its accumulation.

It contains no soap, because soap, for one thing, reduces tooth brush friction. And soap is alkaline.

It is not alkaline, because alkali tends to make the plaque more viscous and difficult to remove.

It contains no chalk. The polishing agent is calcium phosphate, finely powdered—the chief tooth constituent.

Exhaustive scientific tests seem to prove this the ideal abrasive for daily use. It appears to be the most efficient polishing agent which does not scratch enamel.

The product has been submitted to many clinical tests. Before it was advertised, the verdict of high dental authorities placed its value beyond dispute.

Now the facts are told in magazines to millions of people monthly. We are mailing special tubes by the hundreds of thousands to people who ask to try it.

Vast numbers of people are getting results which no former dentifrice gave them. And they are asking their dentist's judgment on Pepsodent's composition.

You should know the formula and know its effects, by actual tests at your chair.

Send us this coupon and we will supply you authentic information.

Pepsodent

The Scientific Dentifrice

The Best Way Known to Daily Combat the Mucin Plaque.

The Pepsodent Co.,
3908 Ludington Bldg.,
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Mail me the facts about Pepsodent.

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Apothesine in Dentistry

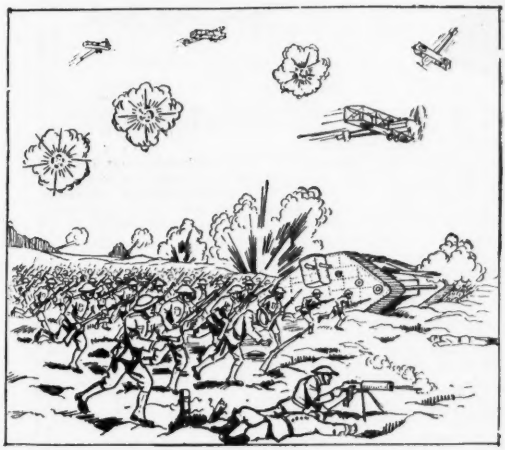
APOTHESINE is used in dentistry in the same manner as other soluble local anesthetics. It is indicated in all minor operations, and is quite frequently used in major operations upon the mucous surfaces, the gums, the alveolar structure, and the teeth. Like other synthetic anesthetics, it is absorbed more slowly than cocaine. For that reason a little more time should be allowed to produce the desired effect.

APOTHESINE has been proved by extensive clinical experience to be fully as efficient as any other local anesthetic, and more potent than most similar products. Its toxicity is low, being far less than that of cocaine and no greater than that of the least toxic of other synthetic anesthetics. Unlike cocaine, it is not subject to State or Federal narcotic law. Apothesine solutions may be freely sterilized by heat.

H. T. No. 218.—Apothesine-Adrenalin (Dental). Each tablet contains 1/3 grain of Apothesine and 1/2500 grain of Adrenalin. One tablet in 1 mil (16 minims) of physiologic salt solution gives 2% of Apothesine, and Adrenalin 1 part in 40,000. Tubes of 20; bottles of 100.

Home Offices and Laboratories,
Detroit, Michigan.

PARKE, DAVIS & CO.



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To Conquer Pain

is the great battle being waged by the busy dentist of today. With Odontoline you can excavate sensitive dentin, grind down, or prepare a tooth for shell crown, remove a pulp, or any similar painful operation, without hurting your patient the least bit, simply by injecting Odontoline around the neck of the tooth directly into the peridental membrane, then wait three to five minutes and proceed with the work absolutely painless. No dentist can afford to needlessly hurt his patients. It is a poor investment. Use Odontoline and send them away pleased.

1 Ounce 75c. 10 Ounces $6.00.

We can furnish Odontoline with Novocain (Procain) or Cocaine base. With the Novocain base you probably know does not require a narcotic form.

For sale by all Dental Depots. Manufactured by

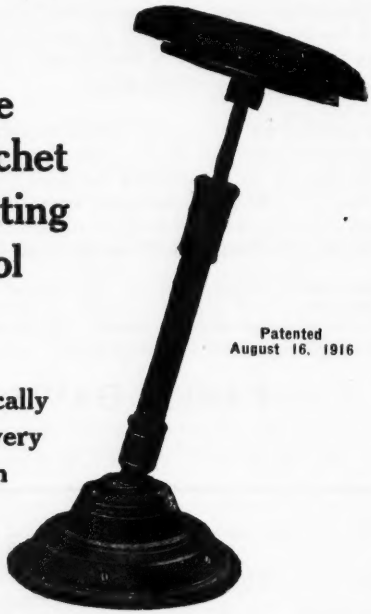
T. M. CRUTCHER DENTAL DEPOT

BOX 686 **LOUISVILLE, KY.**

The Ideal Holiday Gift

A Suggestion for Friends, Wife or Sweetheart

The Noratchet Operating Stool



Patented August 16, 1916

Will Save Nerves

Preserve Health

Increase Working Time

Lengthen Life

Automatically Meets Every Motion

When Slightly Inclined Chest is Thrown Forward and Shoulders Back

A pleasing, agreeable and esthetic, as well as a most sensible and practical addition to the equipment of any office, having no projecting levers; its mechanical features are such as skill, ingenuity and long experience suggest, leaving nothing to be desired.

While the seat revolves freely, such revolution has nothing to do with its height, that feature being controlled by a gripping device within the standard which cannot slip under the weight of the operator. The seat is adjusted up or down by a touch, the adjusting lever being a simple steel ring under the seat, entirely out of the way, yet always just where either hand drops naturally, wherever that may be. No pushing is required, since there are no springs to overcome. It is transported about the office by tipping slightly and rolling upon its base.

The Noratchet Operating Stool Will Help

PRICES

Noratchet Operating Stool.....$20.00

Stock Finishes—Decorated black, gray, mahogany, blue and white enamel.
*Stock Upholstery—Maroon and green plush; green, blue, gray and maroon haircloth; green, black, maroon, gray and red leather.
Special finishes and upholstery, other than above, extra.....$3.00
Special finish only, other than above, extra..... 2.00
Special upholstery only, other than above, extra..... 1.00
Extra height for men over six feet tall, extra..... 2.00

*Subject to market conditions.

Your Dealer will be glad to Demonstrate THIS Stool and fill your order

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TOLEDO, O. U. S. A.

Don't merely use Cement—
Use the correct S. S. White Cement

No single Dental Cement is adaptable to all of your various needs, any more than one kind of medicine is capable of curing all human ills.

Each of the three S. S. White Oxyphosphate Cements has definite characteristics or properties. Every operation requiring the use of cement is surrounded by certain conditions requiring definite treatment.

Greater success will come to you in cementing operations by the careful selection of cement that will fulfill the definite requirements of each case. A guide will be mailed to every Dentist in the United States and Canada which makes this selection easy. Use it and by so doing you will insure the permanency of your work and obtain the most satisfactory results.

S. S. White Oxyphosphate Cements are easy to mix, have low setting temperature and when set are hard, dense and insoluble.

YOUR DEALER WILL SUPPLY YOU

THE S. S. WHITE DENTAL MFG. CO.

"Since 1844 the Standard"

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AMALGAM INSTRUMENTS

(Patents Pending)

EFFICIENCY—the ability to accomplish the greatest amount of satisfactory work with the least expenditure of well-directed effort—this is the keynote of these new Amalgam Instruments."

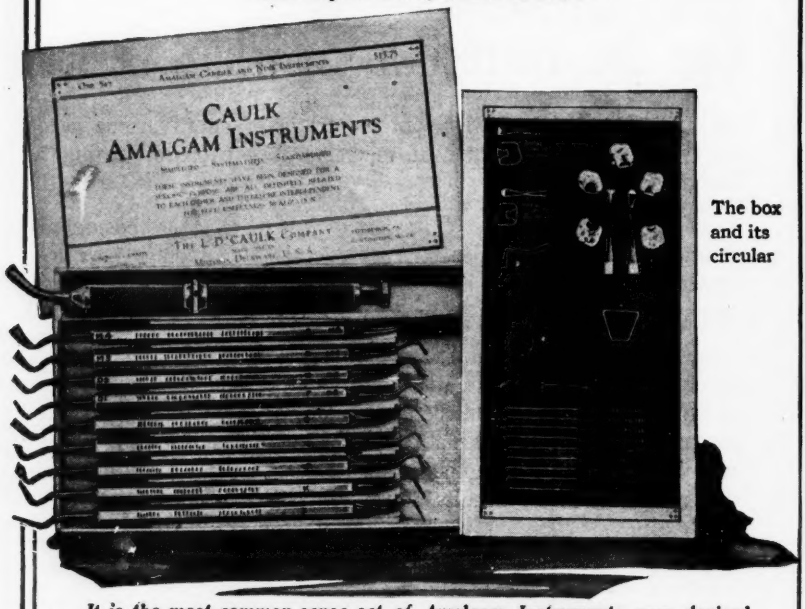
THAT IS WHY the handles are heavier than usual; the grip longer; the shanks short, sturdy, strong, and set contra-angle on the shaft for greatest working convenience and strength.

THAT IS WHY they are *all double end*—yet are ½ to 1 inch shorter than most D. E. instruments.

THAT IS WHY there are *only four sizes packing points* assembled *alternate* instead of *following* sizes.

THAT IS WHY mesial and distal packers are necessary.

The whole story is given in a little folder at your dealer, or write us direct



The box and its circular

It is the most common-sense set of Amalgam Instruments ever devised

THE L.D.CAULK COMPANY
THE WORLDS GREATEST LABORATORIES for the manufacture of DENTAL FILLING MATERIALS
DEPOTS PITTSBURGH HUNTINGTON, W.VA. PHILADELPHIA, PENNA. TORONTO CANADA MILFORD DELAWARE

THE SET COMPLETE

$13.75

THE L.D.CAULK COMPANY

$2.00 Two Dollars and Ten $10.00

These are the prices of the new packages of

Caulk Zinc Cement—plus Copr-Zinc—

The *two dollar box* contains a single shade—powder and liquid—and the *ten dollar box*, six times the quantity—six shades powder and six liquids—both carrying *extra vials Copr-Zinc* to make of your Zinc Cement a germicidal Copper Cement whenever the clinical indications demand and your judgment deems this necessary.*

CAULK ZINC CEMENT is made in laboratories devoting their whole energies to the perfection of dental filling materials.

These two new packages

Two Dollars and Ten

will simplify your buying.

"It is a satisfying cement" that every dealer will gladly sell you.

*Copper Iodide in *Caulk Copr-Zinc* and *Caulk White Copper Cement* is more potent as a germicide than any other form of either copper or silver.—*Caulk Scientific Bulletin No. 1.*

THE L.D.CAULK COMPANY
THE WORLDS GREATEST LABORATORIES for the manufacture of DENTAL FILLING MATERIALS
DEPOTS PITTSBURGH HUNTINGTON, W.VA. PHILADELPHIA, PENNA. TORONTO CANADA MILFORD DELAWARE

THE ADAMS DENTAL X-RAY UNIT

is more than a big step in advance of existing Dental X-Ray Standards, it is REVOLUTIONARY

COOLIDGE TUBE—Absolutely Automatic

No Interrupter—No Rectifier—No Moving Parts

THE ADAMS X-RAY COMPANY

DETROIT, MICH.

EASE OF OPERATION

in removing deposits in the treatment of pyorrhea is attained by the use of

THE IMPROVED DENTINOL PYORRHEA SCALERS

—AND—

THE IMPROVED DENTINOL PROPHYLACTIC FILES

These files and scalers were designed after years of study to perfect instruments of certain angles to conform to the principle of keeping a single point of finger rest on anterior teeth while deposits on crowns and roots are being removed and the surfaces of affected areas smoothed.

THE DENTINOL PERFECT SYRINGE

The only "flat tip" syringe made. The tip being flat and the corners of the tip being round the extreme depth of pyorrhea pockets can be reached with little or no chance of wounding the tissues.

SCALERS (Set of 12)	FILES (Set of 8)	SYRINGE
Price, $13.20	Price, $9.60	Price Complete, $3.00

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The curriculum comprises a three years' course of thorough instruction in all forms of Modern Dentistry.

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302 East 35th Street, New York

IT HAS been fairly well established that Spanish Influenza gets its start in the mouth. Health Board rules and directions all call attention to the importance of keeping the mouth clean, and they also emphasize the importance of clean hands, for the hands are continually in contact with things that may be infected and are constantly going to the mouth.

Of all the personal germicides and cleansing agents there is nothing superior to

DIOXOGEN

Perfectly harmless, yet an effective germ destroyer, it may be used as a mouth wash or with soap to sterilize the hands, or it may be used as a spray for the throat, in fact it may be used in most any way that seems desirable; its flexibility of use combined with its harmlessness and effectiveness constitute its chief claim to distinction.

Dioxogen cleanliness is perhaps the best protection against Spanish Influenza or any of the communicable diseases.

The Oakland Chemical Co.

10 Astor Place **New York, N. Y.**

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ARE MADE TO GIVE THE BEST SERVICE

YOU and your PATIENTS will be pleased with the results.

They clean but do ***not*** injure the teeth; cut or tear the gums.

Use your ***Favorite*** polishing materials. If made into a paste and put inside the cup they will always be right where you want them.

Price, 50c per doz.; $5.50 per gross.

Young's Mandrels are made for these Polishers and are not intended for other uses.

For No. 7 Handpiece. **Price, per set of 5, 15c.**

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Prices subject to change without notice.

The reliable dealers sell them.

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Mail Us that Scrap Gold Today

Government Restrictions on Dental Gold Removed

We wish to thank all the Dentists and Dental Dealers for their co-operation with us in complying with the orders of the War Trade Board curtailing the use of Gold in Dentistry.

The restrictions have now been removed and we can obtain all the bullion necessary for our trade.

THERE'S A WILLIAMS DENTAL GOLD PRODUCT FOR EVERY PURPOSE

You can now obtain Williams Dental Golds the same as heretofore. Ask your dealer about the following Williams Products if you are not already using them:

Williams Mat Gold,

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Made in both Solid Gold and Gold cased. They are properly bent, contoured and semi-adjusted so that with very little manipulation will fit any case.

Williams Gold Plates and Solders

Williams Gold Solder is noted for its easy flowing qualities, tensile strength, fitness, color and fineness. It is a well-balanced solder.

Send us that next lot of Scrap Gold for Refining. You will be delighted with our prompt and satisfactory returns.

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This fact has restricted our output to the profession, but our increased production now enables us to supply ***All Dental Dealers*** promptly.

Insist on N-S Tablets!

No Harrison Narcotic Blank Required.

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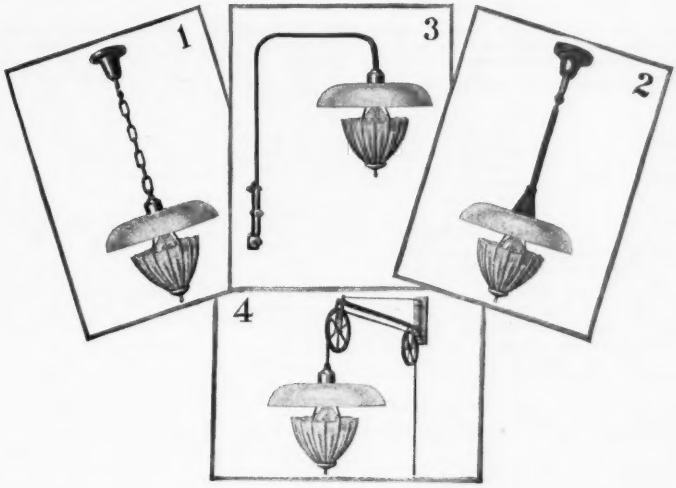

NOTHING can be installed in a dentists operating room which will supply more value than a BOSWORTH OPERATING LIGHT.

The gloomy afternoons, and the early evenings are now upon us, and you need an operating light in order to complete the days work without loss of time.

The BOSWORTH OPERATING LIGHT is made in four different styles, and our new circular (C3) supplies detailed information relative to descriptions and prices. We wish that you would send for a copy. You can order our lights from your regular supply house or from us direct if you prefer.

Now is the time to install a BOSWORTH OPERATING LIGHT—every hour saved for work means more revenue, and ours is the light that conserves!

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The "Bosworth Plan has proven its case! Many dentists throughout the country will gladly testify to their increased earnings since following our teachings. When you are ready to get your first lesson, come in to see us, or write us for particulars.

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FOR SALE—WANTED.

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FOR SALE—Dental outfit as follows: Buffalo dental two-case vulcanizer, Dunham flasks and press, two melting ladles, die and counters, one Columbia Ideal chair, nearly new, one Weber fountain cuspidor, one electro dental engine, one wall cabinet. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Clark gas and oxygen outfit, large tanks and gauges, nasal and face inhalers, gas warmer, analgesia appliances, etc., complete, practically new, cheap. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Clark new model gas outfit with regulators, in excellent condition, bargain. Dr. Max Sterne, 25 E. Washington St., Chicago, Ill.

FOR SALE—Practice and equipment in central Illinois town of 1,000; large farming territory to draw from; $3,200 practice and increasing. Established 20 years. Price $1,000; one-half cash. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Established high grade practice in Edgewater, north side of Chicago, modern equipment, in good building. Going into army. Wonderful opportunity for right man. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Seventeen-year practice, good location, good equipment, good prices. Six hundred dollars cash. W. G. Whitmore, Wooster, Ohio.

FOR SALE—Strictly ethical practice, established fifteen years, town of 9,000, sixty miles from Chicago; will sell at invoice; reason, poor health. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Well equipped dental office in prosperous town near Chicago. Exceptional opportunity for an ethical practitioner. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Second-hand Ritter direct current lathe motor, in good condition, price $35. National Dental Association, 127 N. Dearbarn St., Chicago.

FOR SALE—A complete dental operating room outfit, practically new and will sell cheap. H. H. Schumann, 1519 Marshall Field Annex Bldg., Chicago. (O-376)

FOR RENT—To rent a fine office in Marshall Field Annex, for half days. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Old established dental practice, good location; selling account ill health. Answer, care M. F. Patterson, D. S. Co., Butte, Mont.

WANTED PARTNER—Good dentist as partner in up-to-date office. Fine cash business; Colorado town. Prefer single man, middle age, lover of outdoor sports; must invest $500, and prepared to take entire charge of the office. Am engaging in other business in which I have been successful and offer partner an interest which will make him independent in five years. No speculation. Reference both ways. National Dental Association, 127 N. Dearborn St., Chicago.

UNUSUAL OPPORTUNITY—For a Dentist, a live industrial city of 4,500 in north central Illinois has no dentist. Desirable quarters in excellent location available. For particulars, National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—An ethical dental practice in Seattle, Wash., consisting of two complete modern dental outfits, laboratory and reception room. Two operators busy all the time. Owner busy with other line. $5,000.00 takes it. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Oregon dental practice in town 2,000, several small towns and large territory to draw from; little competition; $6,500 gross a year; big opportunity. Answer, giving references. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Called into the army, must dispose immediately of my most lucrative dental practice. Established fifteen years. Complete modern equipment. Greatest professional opportunity ever offered. Dr. D. M. Olkan, 31 N. State St. Chicago.

FOR SALE—Electric equipment; town of 900, in central Illinois; no opposition; good fees and 98% collections; $600 cash or negotiable notes; going to war. Address W. G. Baird, Table Grove, Ill. (D-341)

FOR SALE—I am drafted; will sell fully equipped office and practice in city of 12,000, growing fast. Dr. J. A. Bigler, East Moline, Ill. (D-345)

TO RENT—A desirable office, vacated by a dentist who went to war. A good dentist would do well here. Address I. B. Mitchell, Charleston, Ill.

FOR SALE—Best practice in northwestern part of Illinois, 1,500 people and four towns of 600 people to draw from; good schools, churches, lights and water; best office location in town. Price $500 cash, without operative instruments. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Practice and full office equipment, good as new, thoroughly established, good fees, family reasons only for disposal at once. Invoice $1,800, but $800 cash and security takes it NOW. National Dental Association, 127 N. Dearborn St., Chicago.

FOR SALE—Dental office and practice in Chicago loop; established 7 years; select clientage; cash proposition; or will rent office without equipment. National Dental Association, 127 N. Dearborn St., Chicago.

WANTED—Good paying dental practice in good town close to Chicago, having good schools. Will pay cash. National Dental Association, 127 N. Dearborn St., Chicago.

POSITIONS VACANT—WANTED

WANTED—Operators in the Free Dental Clinics in Cincinnati. Salary, $60 per month for half time; $120 per month for full time. Apply to the President: Dr. S. J. Rauh, No. 54 Harrison Bldg., Cincinnati, Ohio.

WANTED—Experienced dental man or woman. Give all particulars in first letter. Address S-368, care National Dental Association, 127 N. Dearborn St., Chicago.

POSITION WANTED—Dentist desires position in Chicago with ethical practitioner. Hours 9 to 5. Phone Kedzie 5320.

WANTED—Laboratory man who has had experience and a specially good worker in crown and bridge department. Must be past draft age and furnish A-1 references. State salary expected on application. Address Noa Spears Company, San Antonia, Texas. (S-366)

PRACTICE WANTED—In county seat, ethical practice, prefer northern Illinois, give full particulars in confidence to secure attention, price etc. S-362, care National Dental Association, 127 N. Dearborn St., Chicago.

WANTED—Fine opening for good dentist, position for associate also. Present incumbent drafted. Address Dentist, care 311 Smithfield St., Pittsburgh, Pa. (S-362)

POSITION WANTED—Young ethical lady dentist desires position with city practitioner. Loop preferred. Highest references as to ability, etc. National Dental Association, 127 N. Dearborn St., Chicago.

POSITION WANTED—A reliable all around dentist desires a position with ethical practitioner, highest reference. National Dental Association, 127 N. Dearborn St., Chicago.

WANTED—A graduate lady dentist, thoroughly experienced, one interested in pyorrhea work and removable bridge-work. Address with full particulars, Dr. Howard T. Stewart, 597 Fifth Avenue, New York City. (D-396)

WANTED—All 'round operator. Good salary and commission. Dr. C. L. Beatty, Mansfield, Ohio. (S-355)

WANTED—A Pennsylvania licensed dentist. Steady Work to the right man. Apply to Dr. Phil J. Schusler, Thirteenth and Liberty Sts., Franklin, Pa.

FINE OPENING—For good dentist. Position for assistant also. High salaries; permanent positions. Present incumbents drafted. Address Dentist, 311 Smithfield St., Pittsburgh, Pa.

WANTED—Operator and laboratory man, operator $50.00 to $75.00 a week, laboratory man, $25 to $35 a week. Dr. C. L. Beatty, Mansfield, Ohio. (S-367)

WANTED—A dentist wanted to take established practice in a town of 600 in southwestern Minnesota. There is a big territory to draw from and nothing to buy. Just come and take the practice. Present incumbent has enlisted. Address Dr. H. H. Clark, Edgerton, Minn.

SITUATION WANTED—Young registered dentist desires position with an ethical practitioner in Chicago; highest references, character, ability and habits. Dr. Leon Weniberg, care Dr. D. C. Neymark, 3350 W. 12th St., Chicago. (S-367)

WANTED—Competent man or woman to take interest or partnership. Finest possible clientele and environment. Dr. Edward Girvin, D. D. S., Los Angeles, Cal. (O-353)

MISCELLANEOUS.

WANTED—Dental locations and positions furnished and dental practice handled for sale in 48 states. Operators, Druggists, Assistants, Nurses, etc., furnished. Also medical practices and drug stores handled; drug positions; nurses located. Special plans. F. V. Kniest, R. P., Omaha, Neb. Established 1904.

Ethics and jurisprudence for dentists. Lectures delivered in Northwestern University Dental School. Published by the author. Price, $2.00. Orders, with check or money order, may be sent to Dr. Edmund Noyes, 108 N. State St., Chicago, Ill.

SPECIAL—OPPORTUNITY—FOR YOU—If you are an up-to-date dentist, I want you to take charge of my office, I may sell to you later; in confidence outline your experience, if you come up to my ideal this is a chance of a lifetime for you. National Dental Association, 127 N. Dearborn St., Chicago.

Dentists wishing success with all difficult cases for artificial plates and without any grinding after insertion. The undersigned has done it for many years and will teach others singly or in classes. Address with stamp, J. G. Templeton, D. D. S., 304 S. Craig St., Pittsburgh, Pa. (O-354)

Send your used burs to me. Will pay 50c per gross. No recut ones accepted. Also No. 7. Hand Piece wanted. (349). Dr. W. Weatherhead, Goshen, Ind.

"WEISSFELD BRAND"—Dental Washable Coats made to order or Ready made. Big variety of Materials and Styles. No advance in prices. Chair Covers and Aprons. Free delivery to all the world. Catalogue and Samples on request. Weissfeld Bros., 35-37 White St., Dept. R., New York.

Patents, trade-marks, copyrights, etc. Protect your ideas. Correspondence solicited. John A. Saul, Fendell Building, Washington, D. C.

REO EXCHANGED CARS—1917 3 pass., 4 cyl. Reo coupe, $975. 1218 Michigan av. Tel. Calumet 6050.

FOR RENT—First floor over store, best location in Albany for dentist. Reasonable rent. Address P. O. Box 557, Albany, N. Y. (S-365)

WANTED—Dentist to take care of first-class practice in up-to-date office in Iowa for duration of the war. Address Dr. C. T. Hays, Stanton, Iowa. (A-352)

1918 Goal for Relief Fund $50,000.00

Christmas Stamps Protect Our War Heroes

Return your check for the stamps Now.

The *quantitive formula* of ALBODON DENTAL CREAM, and analytical reports will be sent prepaid to any dentist or dental student willing to make an earnest comparison of ALBODON with other dentifrices with a view to satisfying himself: *"Which is the best one to prescribe in my practice?"*
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"Merit Wins Recognition"

The GREATEST MOTHER *in the* WORLD

holds a sacred place of honor within our homes and in our hearts

THE message that the American people stand as one behind our brave boys and gallant Allies, is the most cheerful "Merry Christmas" we can send them.

Let us make this a Red Cross Christmas—let us see to it that every member of every family joins the Red Cross. She is warming thousands, feeding thousands, healing thousands from her store—the greatest Mother in the World.

All you need is a Heart and a Dollar

RED CROSS CHRISTMAS ROLL CALL

December 16—23

Contributed through Division of Advertising

United States Gov't Comm. on Public Information

This space contributed for the Winning of the War

THIS BOOK

"Professional Denture Service"

tells more about how to take impressions and bites, select and arrange teeth, flask, pack, vulcanize and refit dentures in fewer words than any other ever published.

It is being sent free to every subscriber to

The Dental Digest

for 1918, and will be sent free to every new subscriber for 1919. 256 pages, 223 pictures, nearly all original.

If you want it subscribe now. Prices:

U. S. A. and Possessions	$1.00
Canada	1.40
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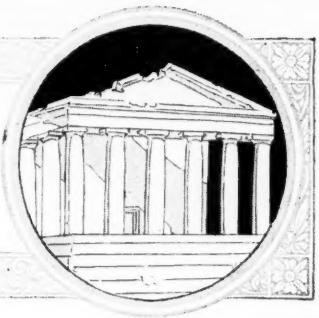
THE DENTISTS' SUPPLY COMPANY

Publishers

220 West 42nd St. **New York, N. Y.**

GOLDSMITH STANDARDIZED CEMENT
WHERE PERMANENCY IS DESIRED GOLDSMITH CEMENT IS INDICATED
GOLDSMITH
(FIXED QUALITY)
CROWN, BRIDGE AND INLAY CEMENT
SCIENTIFICALLY TESTED
PRICE PER BOX $2.00

The Esthetic Use of Gold

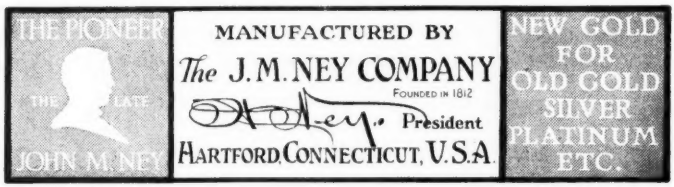


THE justification of dentistry is not its esthetic quality, but its endurance. It is found in service rather than in art. We find that art never precedes utility, but humbly follows.

The prominent place dentistry occupies in human affairs is based on the relief of pain, the stopping of the ravages of disease, and the making of permanent restorations.

This, in most operations, means the use of gold. It has always meant that. An "esthetic" restoration that hasn't a considerable degree of permanency is like a beautiful temple that will not stand.

The esthetic use of gold means its employment to the extent needed for service and endurance, not crudely or immodestly.

You will be able to meet these requirements best in the use of *Ney's Golds*, "Best Since 1812."

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